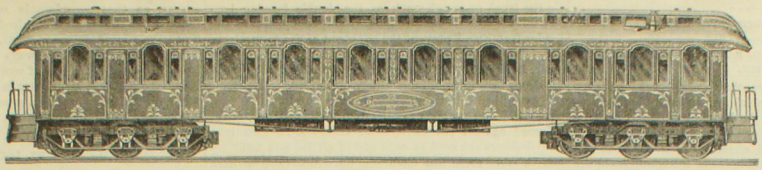
NATIONAL CAR AND LOCOMOTIVE BUILDER.



VOLUME XVII. NUMBER 2. | FEBRUARY, 1886. | SINGLE NUMBERS, TEN CENTS, $1.00 PER ANNUM.

Miscellaneous Items.

THE Bradley Car Works, Worcester, Mass., are building four passenger cars for the Old Colony, and eight for the Boston & Maine roads.

BUSINESS has been so good on the Virginia Midland portion of the Richmond & Danville Railroad lately, that they have had to borrow locomotives from neighboring roads to move the trains with.

THE Leslie Rotary Snow Shovel, which was illustrated in the NATIONAL CAR-BUILDER in May last, has been at work clearing the snow from the Maple River Division of the Chicago & Northwestern Railway. The machine is reported to have done excellent work, and has made many converts to that system of clearing snow from the track.

THE Union Pacific Railway Company are making arrangements to inaugurate a mutual insurance and benefit association for their employés. A part of the plan contemplates the establishing of reading rooms at the various points on the road. We understand Mr. Callaway, the general manager, is taking an active interest in the matter.

THE Chicago & Northwestern Railway Company are putting Moore's door hangers on all the new freight cars they build. The device has also been adopted by the Chicago, Milwaukee & St. Paul, and the Chicago, Rock Island & Pacific Railway Companies. The hanger, as most of our readers know, automatically wedges the door shut, so that no leakage of snow or rain can be forced inside by the wind.

A CHICAGO paper lately told its readers that a revolution in the steel trade is said to be imminent through the discovery of a process by which a grade equal to Bessemer steel, which costs eleven cents a pound, can be made for one cent a pound. It seems to us something must be wrong about this paper's computations. Steel rails of good quality sell for $35 a ton. We would like to retail out these rails at eleven cents a pounds.

IN the shops of the Terra Haute & Indianapolis Railroad, at Terra Haute, they have an emery wheel attached to the cross-head of a planer, and it is used just like a cutting tool for planing guides and other work where accuracy is required. This produces far better work than an emery wheel working under an iron table. The man in charge of this tool says that great care has to be taken not to run the work too rapidly through with this tool, or the heat of friction will leave the work sprung.

AT the last convention of the order of Railway Conductors Mr. Wm. P. Daniels, of Cedar Rapids, Ia., was chosen as editor of the monthly magazine conducted by the organization. The headquarters of the order were also transferred from Cedar Rapids to Chicago. Mr. Daniels was one of the oldest conductors on the Burlington, Cedar Rapids & Northern Railway, and was known as one of the best men on the road. We trust that his success in running the *Monthly* will be equal to the record he made in running trains. In that case the subscribers will invariably receive their paper on time.

IT was believed that the engineers on the Flint & Pere Marquette Railroad were combining to pull fewer cars than the locomotives ought to have taken along, and accordingly the officers of the road determined to test the matter for themselves. One fine morning Master Mechanic Hatswell took engine 75 and hitched on to a train of 45 cars with Superintendent Keeler acting as conductor. They stalled with the train and had to double, so the conclusion arrived at was, that the modern car loaded with twenty tons is not so easily hauled as the cars were in the days when ten tons or under constituted a load.

It is said that about 12,000 cars have been contracted for delivery within the next four months, and that all the contract car shops west of Buffalo have work to keep them running at their full capacity till the end of May. Unfortunately, the large orders represented by this great amount of work were accepted at the low, unremunerative prices that prevailed last year. As the increased demand for lumber adapted for car building has already stiffened the prices of that material, and as other material is having an upward tendency, it is to be feared that the large orders obtained by some of the car shops will prove a misfortune.

SOME of the English engineering papers make very emphatic denials that a locomotive engaged in fast train service will make a greater mileage between repairs than an engine engaged on slower service. As they are in a position to know what they are writing about, we must accept their views as representing the truth about English fast locomotives, but they do not certainly hold good in regard to American high-speed locomotives. Good examples of how protracted the mileage is between repairs of first-class passenger engines may be seen in our table elsewhere, showing the mileage of Pennsylvania Railroad locomotives. One engine ran 251,552 miles without being off the wheels, and another ran 41,510 miles in three months.

MR. C. F. STIMSON, who is in charge of the air brake repairing department of the Union Pacific Railway shops, says there is not nearly so much trouble in keeping the air pump in working order as there was a few years ago. The main source of trouble there used to arise from men using unsuitable oil for lubricating the cylinders, which soon gummed up the small steam passages. When a pump comes in gummed up, a solution of concentrated lye is circulated through it for several hours, till the passages are thoroughly cleaned. A pump is run for three or four years with the standard bushing. By that time the bushing is getting worn, and it is then reamed out, making it $\frac{1}{32}$ inch larger. A good record of the pump is kept, and those that take in the enlarged valve are well known.

THERE are only two coal burning locomotives on the Burlington & Lamoille Railroad, where Mr. F. G. Brownell is master mechanic, but they are operated on the smallest fuel consumption of any locomotives we know of. The road is far from the coal supply centers, and the fuel costs $4 a ton delivered on tenders, so there is a strong inducement to exercise care in its consumption. One of the engines having cylinders 17×24 inches is employed in pulling a mixed train, and the consumption of coal reported is 25 pounds per train mile. The other engine is used exclusively for passenger service. The cylinders are 16×20 inches. This engine is reported as using 20.5 pounds of coal per train mile. The cost for other supplies and repairs is proportionally low.

JAMES K. LAKE, long superintendent of the West Chicago Railway Company, has been for years regarded as one of the ablest street railroad superintendents in the country. Last summer the drivers struck, owing to grievances imposed on them by the board of management, and Mr. Lake had to fight the men with a vacillating backing. The stupid directors who mismanaged their business at that time have now dispensed with Mr. Lake's services, and appointed the Chicago Commissioner of Public Works. We supposed that some experience in the business was necessary to make a man a successful street railroad superintendent, but the luminaries who constitute the directory of the West Chicago Street Railway appear to think otherwise. We feel sure that the stockholders will have reason to regret the change before a year passes.

ON the New York, New Haven & Hartford Railroad, a passenger train was lately derailed by the platform of a station being blown upon the track, and the fireman of the locomotive was killed. The locomotive pulling the train had no flanges on the front drivers, and an attempt has been made to indicate that this want of flanges was the real cause of the engine leaving the track. As the engine truck left the track first, it is hard to see how flanges on drivers were to prevent a wreck. An attempt has been made to work up feeling against Mr. Henney, the superintendent of motive power, for using flangeless drivers. Those acquainted with local sentiment in New Haven say that the real cause of the prejudice against Mr. Henney in the matter is, that he does not permit politicians and bummers to run the shops, an influence that was too potent there before his time.

THE Union Pacific Railway's mechanical department recently turned out at the shops at Omaha a new passenger locomotive, with cylinders 18×24 inches and driving wheel centres 63½ inches. The total weight of the engine in working order is 93,000 pounds, of which 59,000 pounds are on the drivers. The boiler is of best charcoal iron, and the horizontal seams are double riveted with welt. It is of the wagon top style, and is 56 inches diameter at the smallest ring. A single dome is used, which is placed above the fire-box, and is 27 inches high by 28 inches diameter. There are 201 tubes 2 inches by 12 feet 6 inches. The fire-box is steel, and is 34 inches wide and 72 inches long, and has the crown supported by bars and sling-stays. The boiler carries 160 pounds of steam, and has two Richardson safety valves. The cylinders are reversible and interchangeable, and have steam chest ports 16×1¼ inches, the exhaust port being 2¼ inches wide. They are oiled by Nathan sight-feed lubricators. This has been the standard heavy passenger engine of the road, and is well spoken of for efficiency. Mr. Clement Hackney is, we understand, effecting some improvements on the engine. Seventeen new engines of this kind are, we understand, about to be ordered made by one of the contract shops.

THE New York, Chicago & St. Louis Railway Company have lately been examining all their train men and other employés in any way connected with train operating, for sight, hearing and color sense. One of their suburban cars has been fitted up with the appliances used in conducting the examination, and it has been taken all over the road in the charge of Superintendent Gorham, who has conducted the principal tests. The tests are similar to those used on the Pennsylvania Railroad, but an addition is made of requiring the man under examination to read ordinary type matter at different distances. We remained in the car while about thirty men were examined. A good many mistakes were made in selecting colors, but the cause was always that the men did not understand exactly what they were expected to do, or because they were nervous. Mr. Gorham said he had then examined over six hundred men, and there was not a single case of decided color blindness. Defects of vision and short-sightedness were far more common than defects of color sense. We mentioned last month that a prominent Western road had found, when their men were examined for color-blindness, that ten per cent. of them could not read. The Nickel Plate, although a comparatively new road, and the scum of railroad men generally gravitate toward new railroads, showed a very notable contrast to that. Not a single train man was found among the six hundred examined but could read and write.

REGARDING the work done in the mechanical department of the Illinois Central Railroad during last year, Mr. Schlacks, Superintendent of Motive Power, writes us:

We built during the year 1885, 12 new locomotives, 4 passenger and freight, of the ordinary 4-wheel connected American type engine. Cylinders, 17 inch × 24 inch; drivers, 5 feet diameter. Tires made by Krupp. Boiler, wagon-top type, made of steel, thickness $\frac{7}{16}$ inch, front and back flue sheet half inch thick, 175 2-inch flues. Fire-box, 35 inches × 72 inches inside dimensions. Capacity of tank, water 3,000 gallons, coal 6 tons. All axles are of steel, driving journals 7 inches × 7½ inches. Weights as follows:

	Pounds.
Weight on engine truck	28,000
" " drivers	56,000
Total weight of engine	84,000
Weight of tender, empty	20,800
Weight of load of tender { Water 25,000 / Coal 12,000	37,000
Total weight of tender	63,800
Total weight of tender and engine	147,800

Engine was weighed with fire and three gauges of water in boiler. Weight of engineer and fireman, 330 pounds.

We also built four engines of the Mogul pattern. Cylinders, 18 × 24 inches; drivers, 56 inches diameter. Boiler and tank are of exactly same dimensions as the four-wheel connected engine heretofore described, made of steel, and of same thickness and same number of flues.

All axles are made of steel of same dimensions as four-wheel connected engine. Driver journals, 7 × 7½ inches.

WEIGHT OF MOGUL ENGINE.

	Pounds.
Weight on engine truck	18,000
" drivers	68,000
Total weight of engine	86,000
Weight of tender, empty	20,800
" load of tender { Water 25,000 / Coal 12,000	37,000
Total weight of tender	63,800
Total weight of tender and engine	149,800

Engine was weighed with fire and three gauges of water in boiler. Weight of engineer and fireman, 330 pounds.

THE annual report of the Massachusetts Railroad Commissioners states that the number of each of the five approved couplers adopted by the various railroads of the State is as follows: Janney, 4; Hilliard, 24; Cowell, 78; Ames, 294; United States, 840.

SHOP NOTES.

Editorial Correspondence.

CHICAGO & EASTERN ILLINOIS RAILROAD SHOPS, DANVILLE, ILL.

Mr. Allen Cooke, master mechanic of this road, has very commodious and convenient shops, that were built under his own supervision. In the locomotive department he confines himself to repair work alone, but the facilities for doing this work well and cheaply are good. The tool room, which is always a good index of the condition of the shop, is well provided with a full supply of small tools kept in excellent order, and there are numerous special tools for facilitating work and securing accurate measurements. A rather unusual practice is followed here of having the reamers threaded about half an inch at the point. This is said to aid greatly in starting the reamer into a hole, and as it goes farther in it cuts out the mark left by the thread, which is very fine. Mr. Strong, the foreman, uses an ingeniously devised rig with two straight edges set at right angles with a protractor, for finding the correct point of angularity to set eccentrics on the driving shaft. He says he can set the forward-motion eccentrics to their right position this way, and they will nearly always come right when the motion is put together, but the backing-up eccentrics are generally a little out. The same device is also used for quartering axles. Among the other special tools are a straight-edged gauge for finding the vertical line of driving boxes, a device for bending eccentric strap rods without putting strain on the eccentrics, a device for starting out pistons from mogul cross-heads, and a gauge for transferring the centers of wedges.

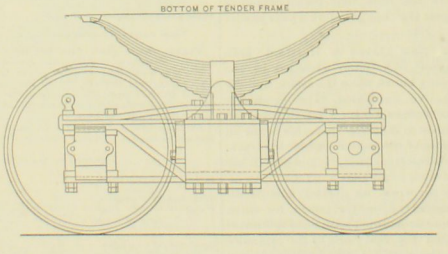
Many of the engines belonging to this road have no back braces, and a shop brace is used when the engines have to be jacked up, which extends from the chafe iron to a bracket on the boiler head. Back braces appear to be of no use except when an engine has to be jacked up, and they are badly in the way all the time; but we would think engines running without them would be liable to get their frames bent when they happen to get off the track and need jacking. That is the time when a portable brace would be forgotten.

Mr. Cooke turns his driving wheel tires in a peculiar way. The principal part of the tread is perfectly straight, but a small fillet is left at the root of the flange. Cut flanges are unknown on the road since this simple remedy was adopted. The eccentrics are secured on the shaft by a key with a toothed face. The shaft has no seat cut on it, but the teeth of the key are forced into the shaft by the set-screw through the eccentric which presses upon it. The plan is said to work as well as splining the shaft and gives far less work, besides, an eccentric can be shifted as easily as if it were merely held by set-screws.

Some trouble having been experienced through the engines working water, Mr. Cooke decided to raise the dry pipes, and he has lengthened some of the domes to do this properly. He raises the top about 33 inches above the center of the horizontal pipe, and finds it quite an improvement. He is using an open stack with some of the engines with the ordinary smoke-box, a diaphragm being used to regulate the draft. Cast iron guides have been used very successfully on this road. One set of guides we examined had been running three years, and during that time the only closing they got was the thickness of one piece of Russia iron. The cross-head was cast iron Babbitted.

They make all their own journal brasses from a known mixture and get excellent results. We examined a set of driving boxes that had been running over two years, and the brasses were in such good shape that the intention was to put them back under the engine as they came out.

The cabs of their switching engines are made wide enough for the engineer to stand on the running-board while working the engine, and the reverse lever is placed in the running board.



The tenders have their springs set as shown in the accompanying cut. This plan was devised by Mr. Cooke when he was on the Atlantic & Great Western Railway years ago, and is used on many engines belonging to that road. It is claimed to be better than the common plan of having the ends of the spring resting on the truck frame because the single point of contact has not any tendency to tip the truck on rough track as the double bearing has. The ends of the spring also give a longer support to the tender frame and prevent the back end of the frame from drooping.

Mr. Bridges Scott, foreman of the car department, has his shops in very creditable order. The work is principally confined to repairs, but they are building one new mail car. The car body is particularly strong, and is reinforced against shocks by four truss-rods. Two iron body-bolsters are used at each end of all the cars built by Mr. Cooke. They are changing an ordinary passenger coach into a smoking car, and fitting it up with dark red leather upholstering, the whole of the work being done in the shops. Some 20-ton new gondola coal cars built for the road have the heaviest sills we have ever seen in cars. Every part of the car is made particularly strong, yet the material is so well distributed that the empty cars only weigh about 19,500 pounds. The side stakes are 5½x4 inches, and come down flush with the bottom of the sill, so the bottom part acts as a leverage to maintain the pressure on the sides of the loaded car.

A curiosity to be seen here is a mail and smoking car made entirely of iron. This car has been running twelve years, with practically no repairs. Any one who maintains that iron is not suitable for car construction should examine this car.

VANDALIA LINE SHOPS AT TERRE HAUTE.

Five new offices have lately been erected for the mechanical and engineering departments of this road, and the officers have just taken possession. The offices of the superintendent of motive power are large, light and convenient, and the drawing office is particularly fine. Mr. Prescott, superintendent of motive power, has a board in his office showing the condition of the engines, which gives important information in a very compact and convenient way. Pegs are on the board representing all the locomotives belonging to the road. Belonging to each peg are three round tickets bound by a ring. The marking on the ticket represents the condition of the engine, and the ticket is hung with the face out, which represents the existing condition of the engine. A white ticket means a new engine, or in condition equal thereto. When a black border ¼ inch wide is round the white, it indicates that the engine has run 1½ year, and needs light repairs under $500, such as tires turned and lost motion taken up. When a black border ⅜ inch wide is seen round the ticket, it means that the engine requires general repairs of machinery, while the border widened to ⅝ inch tells that a new fire-box and general repair will be in order as soon as the engine can be taken in. On the other hand, when the border is ¼ inch wide it gives the engine a very bad character indeed, and indicates that she is not worth repairing. Entire black means condemned. There are columns on the board for the various divisions and for switching, so that at a glance one can see the condition of all the engines, where they are working and in what service they are employed.

In the drawing office there is a case which holds 1,350 tracings, each tracing occupying an oblong box, letters and numbering being used for identification.

There is not any new work going on in the machine shops, but they are busy with repairs, six engines being on hand. They are putting the extension front on all the engines as they go through the shop. Mr. Prescott says the extension front combination not only saves considerable fuel by enabling the engines to steam with larger nozzles, but it is much easier on flues and fire-box than the diamond stack. He believes the whole of the flues can be utilized for steam making with the extension front, whereas with the petticoat pipe the lower flues are made to do the greater part of the work.

This road has a number of mogul engines in freight service, and about the same number of ten-wheel engines. Mr. Prescott has been devoting close attention to the expense of operating with these two kinds of engines, and he is most decidedly in favor of using ten-wheel locomotives. He says that this form of engine does rather more work than the mogul where they are in competition, pulling the same kind of trains on the same divisions, and that the work is done at considerably less expense for fuel and repairs. The long rigid wheel base of the mogul, he contends, causes severe binding in passing round curves, so that considerable more power is needed to move the engine than is required with ten-wheel engines that have a blind driver in front. Then the front driver flanges of the mogul are always being cut, and the pony truck is a constant source of work.

In the car shops, Mr. Carter is building two new cars a week, and he is cutting up a great many old cars that have become too old, light and fragile for the severe service that freight cars have now to stand.

NEW YORK, CHICAGO & ST. LOUIS SHOPS, AT CHICAGO.

The principal locomotive and car repair shops of this road are located at Stoney Island, near Chicago, in a region which appears to have nothing to recommend it except plenty of room. The shops are built in a semi-swamp on made-up ground. The workmen live at Englewood and vicinity, and are transported to and from the shops by work trains. The present condition of the shops is rather like the condition of the famous Highland roads before they were made, but there is the nucleus of good, convenient shops, and they are in the hands of men who are demonstrating that they know how to arrange and equip shops properly.

In both locomotive and car shops they are busy doing repairs. They built twelve new freight cars in December, besides carrying on the current repairs, and they were likely to do about as much work last month. A peculiarity of this shop is the care taken in putting wheels on the axles.

A record is kept of the exact pressure used in pressing on a wheel, and the limits are between 25 and 35 tons.

Mr. Lewis, master mechanic in charge of the shops, has a method of putting new pins in cast iron or steel cross-heads for the ordinary four-bar guides He cuts out the old pin, then slots a wide groove into the inside cheeks of the cross-head and slides a new fitting pin up to the proper place, holding it in position partly by its fit in the grooves, and in part by a rod passed through the pin and riveted to the sides of the cross-head.

Most of the locomotives belonging to this road are of the Brooks build, and they were all made with movable rollers between the center pin casting and the engine truck center bearing. They are not satisfied with that roller arrangement, and are changing it for a rigid center. They are also putting in heavy cast iron deck plates. They use a simple form of traction increaser on some of the engines.

They have an admirably arranged store house in connection with these shops, which we shall have occasion to refer to at greater length in a future issue.

CHICAGO, MILWAUKEE & ST. PAUL SHOPS, WEST MILWAUKEE.

We received a very cordial reception at these shops from Mr. J. M. Lowry, general master mechanic, who said we were welcome to anything that would interest the railroad world. We shall avail ourselves of this kind offer very freely in the near future. They are quite busy in all these shops, and they turn out an immense quantity of work, for this is used as a manufacturing establishment to supply finished material for the whole 5,000 miles of track belonging to the company. Repairing is done in several other shops, but this is the manufacturing center.

In the machine shop, Mr. E. Fairbairn, master mechanic, has twelve engines undergoing repairs, some of the work being very heavy. The extension front is being applied to all the engines that pass through the shop.

Mr. Kittridge, master car-builder, supplied us with some figures that will give an idea of the amount of work done in the splendid shops he is in charge of. During the year 1885, he put 10,310 pairs of wheels under cars. Of these, 16,494 were new and 4,126 were old wheels. There were 2,151 new and 8,159 old axles. They are using paper or other steel-tired wheels under all through passenger equipment. They are changing three old passenger cars into combination cars and making extensive alterations on other passenger cars, the one used by the general manager being among them. They have 18 freight cars equipped with the Westinghouse automatic air brake, and they are used successfully on fast freight trains. Air pipes have been put on 200 refrigerator cars recently.

DELAWARE, LACKAWANNA & WESTERN RAILROAD SHOPS, KINGSLAND, N. J.

We have received some notes from Mr. W. H. Lewis, master mechanic, regarding the work done in his shops lately. He says: "We have under construction two engines of the Mogul type, with cylinders 19×24 inches. The fire-box ring of these engines sits on top of frame, which gives us a fire-box for anthracite coal, 108 inches long by 42 inches wide, which is a good size and ought to allow of our making steam enough. As regards improvements in locomotives, we have had a trial in a few petty matters, but the "great" improvement brought to our notice and deserving of mention is the Rushforth feed water heater and circulator, which we have been using since February last in active service. It gives great satisfaction in the economy in fuel expense. It greatly increases the efficiency of the engines equipped with it, and is a great addition to the locomotive, as it enables us to secure a circulation of boiler water. The first engine equipped with it, was a Mogul which had been built when people did not believe in making locomotives as large as gunboats. The engine weighs 76,300 lbs., cylinders 18×24 inches; her work is of the heaviest nature, hauling heavy coal trains over our division, which you know is overburdened with heavy

grades, curves, etc. This engine makes at present, on an average, 37 miles to one ton of coal. Previous to her being equipped with the heater, her average was 22 miles to one ton of same quality of coal, and performing the same class of work. The engine now makes more steam with exhaust nozzles $\frac{3}{16}$ inch larger than formerly before the heater was applied.

"We have on this division three passenger engines equipped with the appliance, two of which have cylinders 18 × 24 inches, drivers 66 inches, and are running in the express service, doing splendid work, and one with 17 × 22 inch cylinders, 60-inch drivers, doing as well on other trains. Everybody, especially the firemen, are highly pleased with the performance. In addition to the good results, as above shown, I found after about five months of service, upon going to clean boiler, that the cylinder part of same was free from sediment or scale. This was effected by the free circulation of boiler water which the heater guarantees. The scale or sediment drops into the boiler leg, where it can be easily removed. This is very valuable to us."

CHICAGO, BURLINGTON & QUINCY RAILROAD SHOPS, AURORA, ILL.

In reply to inquiries made regarding improvements effected and work done in these shops during last year, we have the following: "We have not made any special improvements excepting in one point, and it is not by any means a new departure, and probably only an improvement for this road. We have been troubled more or less with imperfect stay-bolt examination, and we have finally decided to practically do away with stay-bolt inspection, and in lieu of it, drill the stay-bolts from the outside with a $\frac{1}{8}$-inch hole 1 inch deep. We commenced drilling all the second bolts in alternate rows, but some of our master mechanics, realizing how much benefit they get from this method of drilling, have asked for and obtained permission to drill every bolt in the fire-box, even the crown stay-bolts of all those fire-boxes which are secured, by this method instead of crown bars. When old engines pass through the shops we are more particular about drilling these bolts than in the construction of new engines; and it is quite remarkable that notwithstanding all the sounding our boiler makers may have given the old bolts while the engine was being overhau'ed, the drilling almost invariably leads to the detection of broken ones after the engine has been fired up, and which were overlooked by the sounding process. We have not considered it necessary to drill the bolts on the inside sheet, as more than nine-tenths of those that break are found cracked close to the outside sheet."

We give a list of engines bought and built during the last year for the Chicago, Burlington & Quincy road, as follows: Rebuilt, mostly new, 11; built to replace worn-out engines, 23; purchased to replace those sold, 10. Total, 44.

Master Car-Builders' Club.

RULES OF INTERCHANGE.

The regular monthly was held at the rooms of the Club, 113 Liberty street, New York, on Thursday evening, Jan. 21. The President, Mr. Leander Garey, announced the subject for discussion to be the "Rules Governing the Condition and Repairs of Cars in Interchange Traffic."

The following letters on the subject, that had been received by the Secretary, were then read:

CHICAGO, Jan. 13, 1886.

C. A. Smith, Secretary:

DEAR SIR: I will, as you request, give you my opinion as to which articles of the Rules should be altered or revised.

Rule 3. Paragraph "*f*." The sizes of journals are too small and should be enlarged to $3\frac{1}{4}$ inch limit for 8-wheel 40,000 lb. cars, and 3 inches for 8-wheel cars less than 40,000 lbs. capacity. I considered at the time these changes were made at Old Point Comfort, that we were taking a step backward instead of forward, and still think so.

Rule 5. The paragraph reading, "All cards should be printed and filled in on both sides," should have the words *with ink* added, as many of these cards that are filled out with pencil become so dim that they cannot be deciphered.

Rule 8. The clause reading "All wheels removed for any cause shall be reported to the owner of the car," is altogether unnecessary, and, except in very rare cases, is not lived up to. The bills rendered according to rules are all that are necessary, and this clause is only calculated to give more trouble than it is worth.

Rule 9 has been variously interpreted and should be revised and the wording made so plain that there will be no misunderstanding it. I consider the wording vague and unsatisfactory.

Rule 18 is objected to by some roads, and in my opinion might as well be left out altogether, and in cases where cars are destroyed on private tracks let the managers of the roads interested decide which is liable.

I also, in answer to your inquiry, if I do not think that those who take part in the revision of the rules should not abide by the decision of the majority, answer, *Yes, decidedly*. As far as I am concerned I intend to do so, and if any of the rules do not suit me I will try and have them altered at the next meeting, but will abide by them as long as they are in force.

B. K. VERBRYCK, M. C. B.,
Chicago, Rock Island & Pacific R. R.

BOSTON, Jan. 12, 1885.

C. A. Smith, Secretary:

DEAR SIR: Referring to yours of the 2d, I think something should be done regarding wheels narrow of gauge. Some price should be fixed to govern roads that are compelled to change them on account of their connections. We get a great many cars from the North that will not be received by the Pennsylvania Co., and are not safe to run over our line, or any other, and are owned by companies that have adopted the rules. They still allow this kind of car to run, and offer them for interchange, and are not willing to stand a reasonable expense for changing them. I think there should be a change made in the way of making out bills for changing wheels. These bills should show all marks on wheels put under as well as those drawn. This would show the actual service rendered by such wheels, and would serve to check to some extent a poor class of wheels being used under cars other than those owned by roads changing them.

Referring to Rule 10, last paragraph, I do not understand why the words "or broken" were omitted. I think it is as necessary that they should remain a part of the rule as the word "chipped." We receive a number of bills for wheels with broken treads, sometimes two wheels on one axle. This I consider simply a large chip; but called by another name so as to evade the rule and make a bill. I also think that companies removing wheels for cause, should give the same guarantee to companies owning car that wheels were put under, as they get from the wheel maker that wheels were punched from. And if they (the companies) change wheels are also wheel makers and put under their own make of wheel, should give same guarantee as any good wheel maker would. I do not consider it right to take out a wheel that there is a guarantee on and substitute another without any. The company loses the wheel removed because they cannot return it to the maker; and should the wheel substituted prove a failure, that is also a loss. We have had a number of such cases. Referring to last clause of your letter, I say most emphatically, *Yes.*

J. B. HENNEY, S. M. P.,
New York & New England R. R.

MONTREAL, Jan. 19, 1886.

C. A. Smith, Secretary:

DEAR SIR: Replying to your kind invitation to attend your next meeting. The subject for discussion is a very important one. I am sorry to say that I shall not be able to attend, but will endeavor to give you a few points which I think would tend to make the existing rules more clearly understood.

Rule 3, paragraph *a*, wheels cracked or broken. I would add to this, "Except when delivered to owners," as I presume all owners would prefer to do such work for themselves.

The card question is an important one, and I am afraid is somewhat abused. A foreign car will be received in good faith at one point, and when being delivered to a connecting line at another point, will frequently be refused for a broken intermediate, or some other defect which possibly has existed in the car for months. In such a case, if I put a card on this car it makes my company responsible should any one undertake to do the repairs called for, whereas, my company is in no ways responsible. Many such cases have come under my notice, and cause a good deal of dissatisfaction. In my opinion, the carding system should be limited as much as possible, and so encourage owners to keep their stock in good condition.

Rule 9. In this rule the prices allowed for second-hand wheels are entirely too high, and I am afraid result in a great many more second-hand wheels being used than is desirable. I think the old system of allowing $2 per pair for second-hand wheels is ample, and when proper care is exercised, I think it is desirable that old wheels may be mated with new, as in my experience one wheel of a pair may fail when they are comparatively new, and it is easier mating such a wheel with a new one than with the old.

No charge should be made for turning axles, unless new.

Rule 12 to read: "The ends of the splice to be not less than 12 inches from the body bolster, between it and head stock."

I think it is desirable that all who take part in the revision of these rules should abide by the decision of the majority.

W. MCWOOD, Asst. M. Supt.,
Grand Trunk Railway.

ALLSTON, Mass., Jan. 19, 1886.

C. A. Smith, Secretary:

DEAR SIR: As per your request in your letter I inclose you my views as follows in regard to the "Code of Rules Governing the Condition of and Repairs to Freight Cars" adopted at Old Point Comfort, Va., June 11, 1885.

Add to the resolve preceding Rule 1 the following: "The number of cars of each road to be taken from Poor's latest Manual, and no vote will be allowed on cars owned by any private company."

Rule 1. The only addition needed in this rule is the definition of the words printed in italics.

Rule 5. No objections, but am sorry to say quite a number of railway companies are afraid they will not be justly treated, therefore they refuse to card cars unless the receiving party agrees to receive it with the additional wording, "This is not a voucher to repair cars," or words to that effect. As I understand it, they take the ground that the damage was done before they received the car, consequently they ought not to be liable for the expense of repairing it. My judgment is that an example made of careless inspectors would remedy the matter. In other words, I believe in close inspection, and if a defective car was found on our road it would be sufficient evidence that it was broken by us, unless of course the car was carded. I would not agree, however, to be so governed unless our connecting roads would agree to do likewise.

Rule 8. I would insert in the third paragraph after the word "chipped," the following: "So as to materially injure or endanger its use." As the rule now reads, the slightest chip of flange may cause the car to be rejected.

Rule 9. I am in favor of rule relating to charges, but would prefer the simple manner as in rule previous to the adoption of the present one, viz., one new wheel so much less, one scrap wheel so much.

Rule 13. I would add to this rule after the words "material removed" the following: "and any company departing from the preceding rules without authority can by placing a card on the car signed by the proper authority, forward the car home where alterations may be made and the proper credits given, and interchange roads shall receive said car when so carded, providing it is in safe condition to proceed home."

Rule 17. I would add to this rule a clause that would cover the following class of cars: "There are a large number of private cars bearing the name or initials of a railway company, but are not cared for by such companies, and owners of such cars are liable for repairs as per rule 17; but it is almost impossible to tell which are private cars, and which belong to a railway company. I think some plan ought to be agreed upon, or mark or letter such cars so they would be known to all having repairs of cars in charge.

Rule 19. I consider this rule is all right, but I hardly think it proper for any railway company to send its representatives to the annual meeting of our association and participate in the discussion and take part in the adoption of a code of rules, and because there may be objections to some particular rule, will, upon their arrival home, pick out such rules as do not meet with their approval, and refuse to be governed by such as meet with their disapproval. Now I take the ground that the rules as a whole are right, and I propose to be governed by them. I may have more or less objections to some particular rule, but as the majority of the car-builders present at the meeting having agreed upon a code of rules, I can see no just cause why I should not be governed by the objectionable ones, and try again at the next meeting to have the objectionable ones altered.

F. D. ADAMS, Gen. M. C. B.,
Boston & Albany R. R.

Mr. C. A. Smith said that the number of cars as given in Poor's Manual would in some cases be less than the actual number in existence. He was not aware that any private company had ever voted in the meetings held for revising the rules.

Mr. Garey could not understand why Mr. Adams should object to allowing private companies to vote on the cars owned by them. A railroad company may run a car over its line and make repairs to it, or to any number of cars that may be owned by a private company. As long as they run the cars, are responsible for the repairs to them, take care of them, and they are a part and parcel of the cars that are governed by the rules, he could not see why the railroad company should not have a vote upon them.

Mr. Smith thought that the journals should be larger for a 20-ton car.

Mr. J. W. Marden remarked on the importance of having competent inspectors, and of giving to them a higher place in the car departments than they had hitherto held. In regard to the charge for turning axles, he thought the rule as it stands was not understood alike by all the roads. He had made out bills since August 1, charging for every change of wheels and for every axle. Since the circular of the Executive Committee was issued, he had only charged for new axles, but was now informed that a great many roads were ignoring the circular and making a charge for every axle changed. He thought the present system of making bills for wheels, if the bills were properly filled out, was all that was necessary.

Mr. Smith thought that wheels removed should be reported to the owners of the cars, as provided in Rule 8, and referred to a case in which five out of eight new wheels were broken in an accident and replaced by old wheels, and nobody knew where it was done or who did it.

Mr. Garey regretted that some of the rules were so worded as to be liable to different constructions. The condition of cars in line service was getting worse every year, and the result would be something in the shape of clearing houses located at certain points where these cars could be repaired by contract.

Mr. Marden thought that if all the roads interested in the rules would send representatives to the meetings for revision, and thoroughly discuss the subject, there would be much less difficulty than there is now. There was no question but the rules were misunderstood, at least by the inspectors. At present the inspection was different at different points, and the inspectors along the same route could not agree as to what constituted a safe running car. He thought it might be possible to arrange some way by which the roads owning cars should pay for all the repairs done on their own cars, unless in case of an accident or running repairs. The company owning the car gets a mileage for its use over different roads, and he did not know why it should not pay for the repairs to such cars, and have them repaired as they want them repaired.

Mr. Garey thought the clearing house plan would tend to secure greater uniformity in the construction of cars. The companies forming the lines and who own the cars, should agree among themselves that the cars should be kept in a condition to warrant the running of them from one terminal to another. In the matter of revising the rules, there was a lack of concert of action. Every man who goes into the meetings works independently of everybody else. When a suggestion is made to amend a rule, if it is one that is new to him, he is called on to vote before he has considered the matter. He is undecided, and looks round to see how the vote is going, and if there are a good many voting for it he goes with the rest.

Mr. Smith announced that the subjects for the February meeting of the Club would be "Car Paints and Car Painting, including Repairs of Cars by Contract."

Railway Master Mechanics' Association.

The following circulars have been issued by the committees appointed to investigate the subjects named:

SHOP TOOLS.

The Committee on Shop Tools respectfully ask for the following information:

Please state if you have used Milling Machines instead of Planers for Surfacing Work. State kind of work surfaced and difference in time in favor of either machine.

It is not necessary to give the number of hours occupied by a machine, in performing a certain amount of work. The result, if given in form of a percentage in favor of the one or the other machine will answer quite as well, the object being to simply ascertain which is the cheaper method, and to what extent.

If you have anything to suggest in the matter I shall be pleased to have you do so.

Address D. A. WIGHTMAN, Supt.,
Pittsburgh Locomotive Works,
Pittsburgh, Pa.

BALANCED SLIDE VALVES.

The Committee on Balanced Slide Valves request an early reply to the following questions:

1. With what Balanced Slide Valves for Locomotives have you had experience? Please send sketch or drawing of same.
2. Upon how many engines were these valves applied? Give date when the first of each description was placed in service.
3. If you have had experience with more than one kind of Balanced Slide Valves, please state which you consider on the whole the most satisfactory, and name the good and bad features of each valve.
4. What is the cost of these Balanced Valves, and necessary adjuncts, per engine, compared with the ordinary valve?
5. What is the average cost per engine per annum of maintaining these Balanced Valves and their seats? Give figures applicable to each twelve months after valves were placed in service, until their renewal was required. Give similar figures in the case of ordinary valves on the same class of engine, and if possible mileage made each year.
6. What mileage is represented by one-quarter inch wear of Valve Seats of similar engines, when using, and when not using the Balanced Valves, and state if Vacuum Valves were used in each case, on Steam Chests.
7. When packing strips are used, what width should they be to give best results? Should they and the grooves in valve be fitted by scraping, or will planer and milling machine make a sufficiently good finish.
8. When springs for holding up the packing strips are used, what kind give best results?
9. What increased life of valve gear is obtained by using Balanced Valves? Does it thereby reduce the cost of engine repairs to an appreciable extent.

Do not confine your answer to the above question, but please give any information, statistics or opinion you may have on the general subject of Balanced Slide Valves for Locomotive use.

Replies to be addressed to Charles Blackwell, Roanoke, Va.

CHARLES BLACKWELL,
E. M. ROBERTS,
JAMES MEEHAN,
} *Committee.*

IMPROVEMENT OF LOCOMOTIVE BOILER CONSTRUCTION.

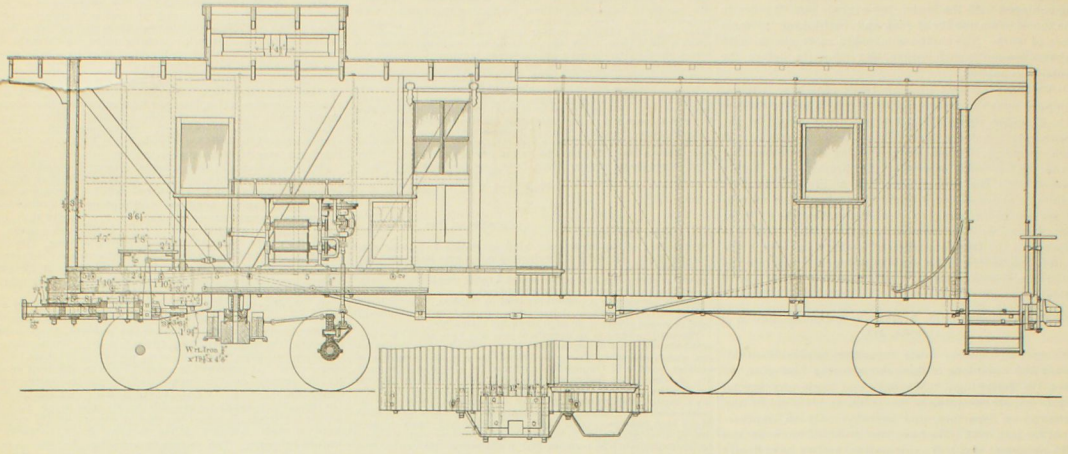
The Committee on Improvement of Locomotive Boiler Construction respectfully request such general information as you can give of the art, and particularly to that of improvements (however minute a nature), and to those of a character that permit a higher steam pressure to be carried, and to first cost and maintenance of the Wootten Boiler or boilers of similar or any design in comparison with those of usual type.

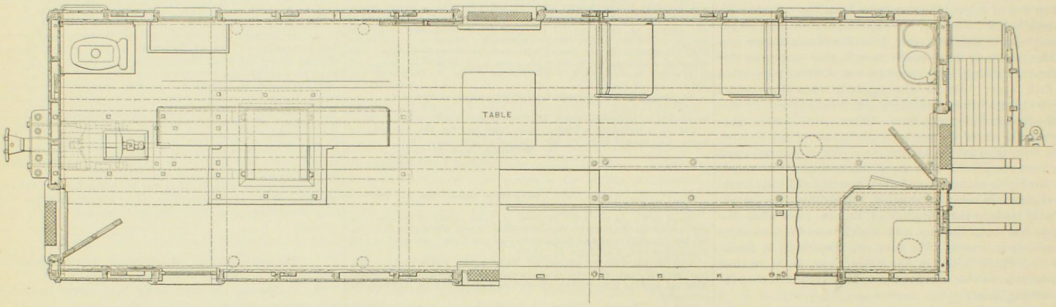
Drawings should be sent, illustrating improvements, and communications as regards the whole or part of the subject under consideration will receive attention.

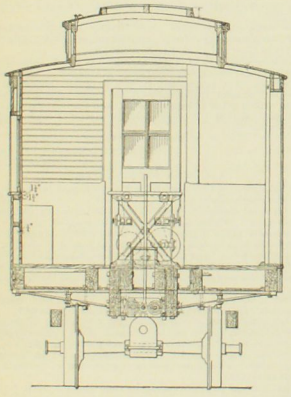
Replies should be addressed not later than April 1, 1886, to G. W. Stevens, Sup't. M. P., L. S. & M. S. Ry., Cleveland, Ohio.

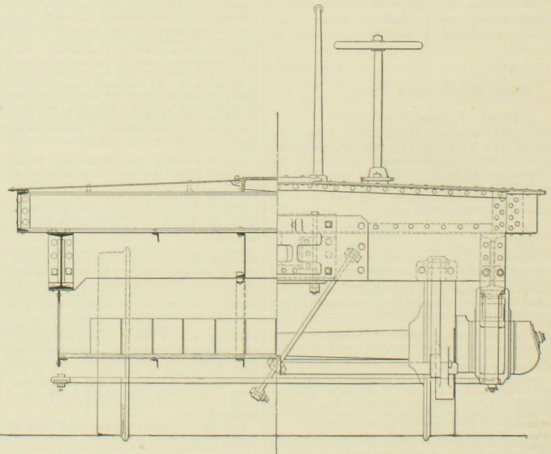
GEO. W. STEVENS,
WM. FULLER,
T. J. HATSWELL,
} *Committee.*

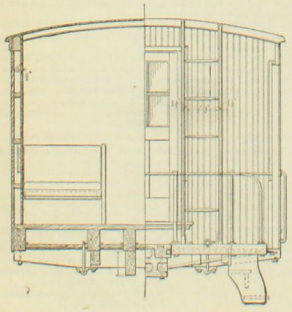
TRACTION DYNAMOMETER CAR—CHICAGO, BURLINGTON & QUINCY RAILROAD.











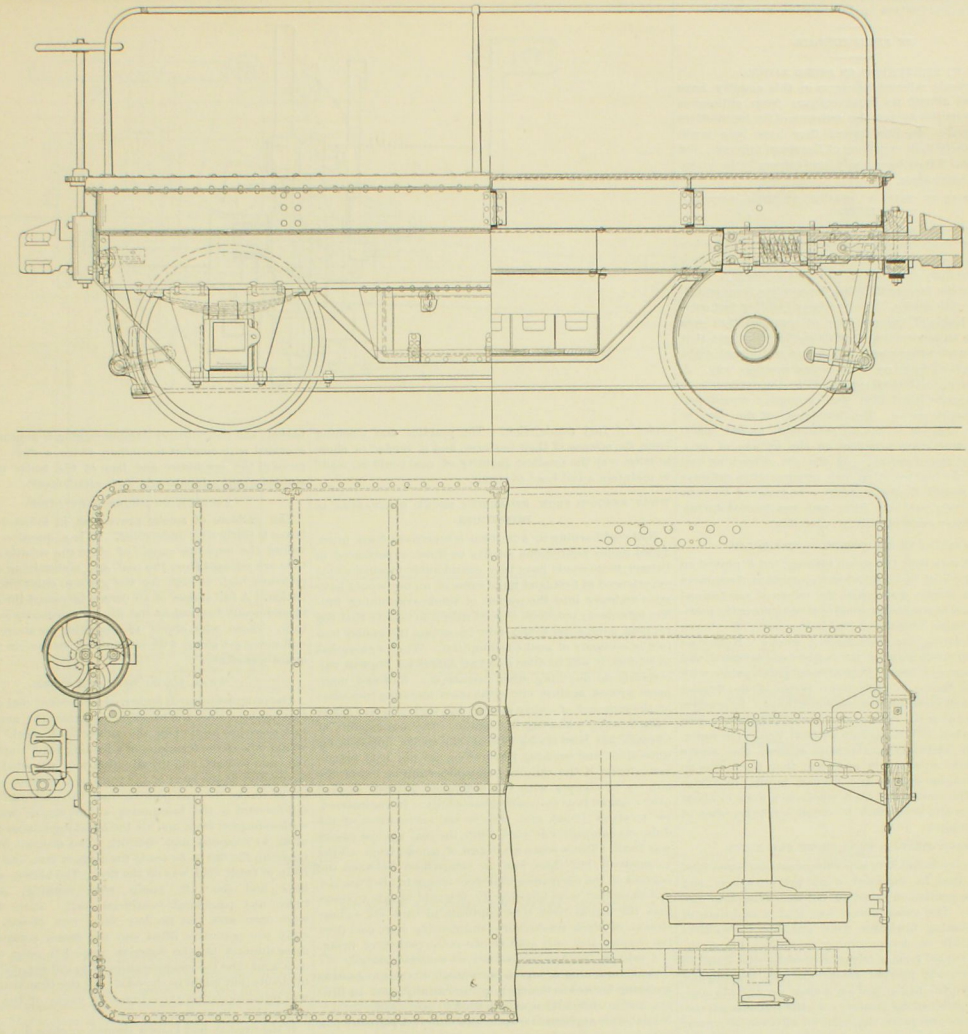
The engravings show the design and construction of the Traction Dynamometer Car used by the Chicago, Burlington & Quincy Railroad Co. It was made from drawings of the apparatus used by the Pennsylvania Railroad Co., and is similar to it, with the exception of slight modifications suggested by them, and also by recent use of the car.

In principle, it is simply a recording spring balance, with speed and distance recording attachments. The car is similar in its general construction to the standard way-car, without the high cupola, and has no platform at the dynamometer end.

To secure a rigid connection between the draw-bar and recording apparatus, an additional oak timber is placed inside of each of the middle sills, and the base-plate of the recording table fastened to a piece of boiler plate, which is bolted to them.

Between the front ends of these timbers and the sills, are bolted pieces of ⅜-inch plate, 4 feet 6 inches by 19½ inches. These plates are carried to the lower edge of the draft timbers, which are bolted to them, and to the oak timbers above. The draw-bar guides and stops are fastened through these plates to the draft timbers. Two round bar spiral springs 6 inches in diameter and 11 inches high are used. These are placed between two wrought iron spring plates, which are supported on a central bolt 2 inches in diameter. The draw-bar is fastened to the front end of this bolt, and the back end carries a vertical arm running up into the car. The draw-bar, as originally made, was supported at the back end by a guide fastened to the draw timbers. The spring plates also moved between end guides, and were placed loosely on the central bolt. This allowed of considerable lost motion, and caused much inaccuracy in the indications. In order to obviate this, the central bolt was lengthened and supported by bearings at each end.

The spring plates were bushed, and have bearings 8¼ inches long around the central bolt. These bearings have



good sliding fits, and insure the spring plates being exactly parallel in all positions. The springs have their ends ground parallel and perpendicular to the axis. They are of equal height and very uniform in deflection. To allow free motion to the draw-bar without affecting the recording apparatus, it is connected to the main bolt by a ball-joint. The spring plates have stops back and front, so the springs register both push and pull on the draw-bar.

All the wearing parts are easily accessible, are kept well lubricated, and are protected from dust by a sheet of rubber cloth fastened to the draw timbers beneath.

The upright bar from the draw-bolt is connected to the lower end of a vertical lever at the end of the table by a rod provided with a sleeve nut. The upper end of this lever is connected to a pair of iron rods bearing the pen-carriage, and sliding in guides which admit of a free backward and forward motion. The vertical lever doubles the motions of the draw-bar, so that the pen registers twice the deflections of the springs. At one side of the movable pen is an adjustable rod bearing the datum or base line pencil. This is set so that the two pens trace the same line when there is no load on the springs.

The recording paper is 14 inches wide, and can be driven at speeds of one foot and two feet per mile by means of suitable tension and friction rolls geared from the axle. Motion is transferred from a worm on the axle through a reversing clutch to a pair of spur change wheels. The vertical shaft from the axle has a slip and universal joints to allow for the motion of the truck and car body.

The change wheels gear into pinions on a worm shaft, from which the motion is transferred to a rubber tension roll, and to a receiving roll moved through a pair of adjustable friction plates.

Under the rods bearing the traction pen, and in line with it on each side of the paper, is placed an electro-magnet, the armature of which is arranged to carry a stylographic or glass pen. One of these is connected to a clock which completes an electric circuit every five seconds. The other is connected to electric buttons, and is used to locate mile posts, etc. The pens make a straight line, except when the circuit is completed, which causes a slight offset due to the motion of the armature. The distance apart of the offsets made by the clock circuit, for a given travel of the paper, is proportional to the speed of the train, and records the rate every five seconds to within a mile an hour. The transmitting levers and fulcrum bearings have been considerably strengthened to avoid springing.

Four sets of springs are used for different grades of service, the lighter ones being used in experiments with single cars, and the heaviest for the traction of consolidation engines. Some trouble was experienced at first owing to the setting of the springs, and, on an average, 500 miles of heavy service were necessary to overcome this tendency.

Freight Train Brakes.

A meeting of those interested in this question took place on Jan. 6 at Harrisburg, Pa. Messrs. G. W. Rhodes, John S. Lentz and W. T. Hildrup, members of the Master Car-Builders' Association, were present on behalf of that association. The brake companies were represented by Gen. I. B. Gray and Mr. George H. Poor (American Brake Co.); Mr. James H. Slade (Eames Vacuum Brake); Mr. R. M. Agnew (Rote Brake); Mr. I. B. Tallman (Tallman Brake); Mr. John Welsh (Westinghouse Air-brake Co.); Mr. W. F. Widdifield and Mr. L. G. Richardson (Widdifield & Button Brake).

After a thorough and friendly interchange of views, the following circular was issued with the cordial assent of the representatives of the brakes present at the meeting:

At a meeting of the Committee of the Master Car-Builders' Association on Freight Car Brakes, held at Harrisburg, Jan. 6, 1886, it was decided to abandon the tests originally proposed, and in lieu to invite the manufacturers of freight car brakes to competitive tests to be held at Burlington, Ia., July 13, 1886, and April, 1887, under the following conditions:

1. Each brake company will furnish, fitted with its brake, fifty 30-ft. or 34-ft. box cars of 40,000 pounds capacity; 34-ft. cars being preferred. Each car to be equipped with brakes on both trucks, and plain cast-iron shoes. The cars to be delivered to the committee free of charge at some point on the Chicago, Burlington & Quincy Railroad, on or before July 7, 1886.

2. The first test will take place at Burlington, Ia., on the Chicago, Burlington & Quincy Railroad, on July 13, 1886. After this trial, the cars will be returned to the owners at the point of delivery and put into general service.

3. An endurance test under the supervision of the roads owning the cars will then take place. A careful record of the cost of all repairs to brakes will be kept except as regards the foundation brake (beams, shoes, blocks, hangers and brake levers). The mileage of cars while undergoing this endurance test will be kept as far as practicable, and all brakes are to be kept in constant use until the second test in April, 1887.

4. In April, 1887, the cars will be returned to Burlington, and without being prepared for trial the July tests will be repeated.

5. Two similar eight-wheel freight engines will be employed in the Burlington tests. These engines have 17 by 24 in. cylinders and not less than 51,000 lbs. on the drivers, one engine to be equipped with the Westinghouse driver brake and the other with the Eames vacuum driver brake. Both tender trucks to be fitted with brakes, plain wrought-iron shoes to be used on engines, each brake company to have the option of selecting either of these engines for use in the trial of their brake.

6. The Chicago, Burlington & Quincy Railroad will not be held responsible for mileage of cars while on its lines, nor for any damage to the cars that may occur through the inefficiency of the brakes.

7. Three or more competitors will be required before the tests will be entered into. Any competitor desiring to enter the tests should communicate with the Chairman on or before April 1, recommending any feature of device that should be brought out during the trials. The Committee, prior to May 1, will hold a meeting to formulate the rules governing the tests, of which each competitor who has signified his intention of entering the tests will be apprised. Competitors will be required to submit to all tests that are decided upon by the Committee. The Committee are not in a position to provide equipment for these tests, but regard the subject as of great interest to railroad companies, and trust they will contribute to its success by furnishing cars to the competing brake companies, and afford them any other reasonable facilities.

G. W. RHODES,
W. T. HILDRUP, } *Committee.*
JOHN S. LENTZ,

Smoke Prevention in Locomotive Fire-Boxes.

BY ANGUS SINCLAIR.

NO RESTRICTIONS ON SMOKE RAISING.

Until recently railroad managers in this country have encountered almost no inconvenience from ordinances enacting penalties against the nuisance of the locomotives causing smoke. In this respect they have been much more fortunate than managers of European railways, but it is doubtful if they have really been gainers by the immunity from restrictions.

RESTRICTIONS IN BRITAIN AGAINST SMOKING LOCOMOTIVES.

For years before any movement was started in Great Britain to prevent factories and furnaces from following their daily practice of pouring dense volumes of black smoke constantly over towns, cities, and country, there were very strict laws prohibiting locomotives from polluting the air with smoke. When railway building first commenced in England, the new form of transportation was regarded as an innovation on established institutions that deserved no encouragement, and it was considered right and proper to sit down on it in every possible way. A popular bugbear exhibited constantly by the opponents of railways was the belief that the locomotive would pollute the air with smoke. The legislators of the day, in their desire to defer to public sentiment, passed enactments imposing heavy penalties on the owners of locomotives that raised smoke. As the art of burning coal without smoke had made but little progress when railways were first opened, the locomotives were designed to burn coke exclusively, and very little coal was burned during the first twenty years of railway operating.

INVENTING SMOKE-CONSUMING FIRE-BOXES.

Coke did very well for steam making, but it proved an expensive form of fuel; and when the question of economy arose, as it always does arise, the minds of mechanical engineers and of scientists turned to investigating the possibility of burning bituminous coal in locomotive fire-boxes without violating the laws against smoke. Numerous forms of smoke-consuming fire-boxes were invented and patented, many of them being ushered to the public with ostentatious claims to perfection. Some of the devices were good and many of them were worthless. In practice it was found that the best smoke-consuming fire-box was worthless when left to operate without intelligent supervision. The statutory enactments against the smoke nuisance were so savagely enforced, that there was no danger of engine drivers and firemen lapsing into carelessness. The emission of black smoke in a town or about a station was almost certain to entail a rebuke, often of the sharpest kind.

CAREFUL FIRING A GOOD SMOKE PREVENTER.

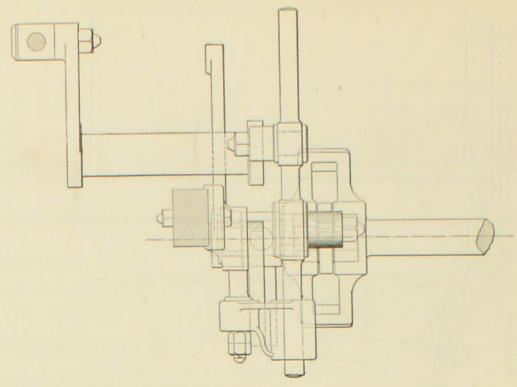
Nearly every locomotive superintendent had some kind of fire-box that he supposed would prevent smoke, and few of these gentlemen failed to put their ideas into tangible form. The consequence was, that a multitude of smoke-consuming fire-boxes were put into locomotives that were only smoke-consuming in name. But no excuse was accepted from a driver or fireman who failed to make his fire-box prevent smoke, and the consequence was that skillful firing had on numerous roads to compensate for deficient appliances. As the measure of success in smoke prevention depended in all cases to a great extent upon careful firing, careful firing became the rule, and produced economy of heat as a direct result.

EARLY METHODS OF SMOKE PREVENTION.

When steam was shut off in approaching a station and the engine began to emit smoke, the fireman would close the dampers, open the fire-box door and start the blower a little. Usually this would clear off the smoke. But if the fire had fresh coal on the top, or if the fireman was making up his fire at a station, the smoke would not be so easily vanquished; but a good fireman would quickly manage it by holding his shovel in at the door slanting towards the fire for a few seconds, by which means a current of air would be projected upon the fire surface starting a flame, which would be kept up by leaving the door a little open. From this practice of deflecting air with the shovel, originated the baffle plate, which is fastened inside the fire-box above the door, and deflects the air passing it through the door towards the fire.

PROVIDING MEANS FOR REGULATING THE SUPPLY OF AIR.

It was found by practicing the smoke preventing methods of firing, that the quantity of air admitted to the fire and the way it was admitted exerted an important effect on smoke prevention. It was found necessary that enginemen should have the means convenient of regulating the admission of air above and below the fire with some degree of accuracy. So, close ashpans and dampers that fitted the openings were provided; then came various methods for supplying air above the fire, which were generally capable of being regulated so that the supply would not exceed the need. This means of restraining the supply of heat just to meet the demands of steam making was a long stride on the way of fuel saving. Watching and manipulating the smoke-preventing appliances was an excellent training for enginemen, because it familiarized their minds with what were really the underlying principles of fuel combustion. The practice was teaching them the science of their business, and it tended to show in what way the smallest quantity of coal could be made to maintain a full head of steam.



WHAT RESULTS FROM REGARDING SMOKE ORDINANCES AS IMPOSITIONS.

Had coal-burning in American locomotives been introduced under restrictions similar to those experienced in Britain, there would have been considerable inconvenience experienced at first, and large sums of money would have gone uselessly into the purses of smoke-consuming fire-box patentees; but there is good reason to believe that the railroad companies would now be saving the money tenfold in economy of coal consumption. When a thing has to be done it will be done; and an American fireman can certainly do anything other firemen do. Railroad managers protest against city ordinances imposing penalties on the nuisance of smoke raising, but they protest against what is really a blessing in disguise. The municipality of Chicago has been trying to abate the smoke nuisance for some time, and smoking locomotives are not held blameless. Some of the railroad companies running out of the city try to comply with the ordinance against smoke; others ignore it as an impracticable folly. It was instructive to stand round and observe the locomotives of the different companies at work while the zeal against smoke was fresh. There was a good deal of smoke from all the locomotives, but there was no comparison between the engines of the companies that were trying to obey the law and those that were ignoring it. It would be safe to assert that the locomotives that continue to emit an endless stream of black smoke burn considerably more coal than the engines that only emit smoke at the periods of firing.

SIMPLE APPLIANCES NEEDED TO PREVENT SMOKE.

Coal containing as high a percentage of volatile gases as anything burned in America, is successfully used in Britain, and no difficulty is experienced in preventing smoke. No elaborate appliances are provided either. A plain fire-box with brick arch and means of regulating the supply of air above and below the fire is, as a rule, all the provision made. The means of regulating the air appears to be the simplest and least expensive part, yet it has received the least attention among us. Very carefully conducted experiments have demonstrated not only that it is impossible to prevent the production of smoke with a full and free admission of air under the fire, but that it also tends to cause spark throwing by putting the smaller particles of the fire in commotion.

DAMPER OR NO DAMPER?

In his paper describing the engines of the London, Brighton & South Coast Railway, Mr. Stroudley says, under the head of "Ash-pans": "Care has been taken to provide these engines with means for effecting perfect combustion of the fuel, and to prevent the emission of sparks. To do this, they have been fitted with an air-tight ash-pan, which has an angle across the opening for the damper at the back. A damper having a handle convenient to the driver is arranged to shut practically air-tight, giving him the means of adjusting the amount of air. These contrivances combined with the comparatively extensive grate and heating surface, and with large blast nozzles, entirely prevent the emission of sparks."

British locomotive designers invariably devote careful attention to the ash-pan and damper details, and it is recognized there that the matter fully repays the labor expended upon it. Here any special attention to ash-pan and damper details is the exception rather than the rule. As makers and master mechanics habitually neglect the means of regulating air below the fire, the enginemen naturally regard the appliances as of no consequence, and the rule is for dampers not to be touched from one end of the road to the other. While this practice continues to prevail there will be no smoke prevention and no coal economy. The average ash-pan is made as airy as a clothes basket, and the ordinary damper rigging is not made to be operated with comfort more than twice a day. A little more of the machinist and less of the boiler maker is wanted about ash-pans and their attachment.

PROBLEM OF SMOKE PREVENTION.

The problem of smoke prevention in locomotive fire-boxes is fairly well understood. It is a question of providing the requisite supply of air to the volatile gases as they are released from the coal, and maintaining the temperature high enough for the gases to enter into combination. A full supply of air cannot be passed through the incandescent fuel unless the fire is constantly kept very thin. Those who object to admitting air above the fire will never get along without causing smoke—in no small quantities either.

WHAT WE DO WITH OUR SMOKE.

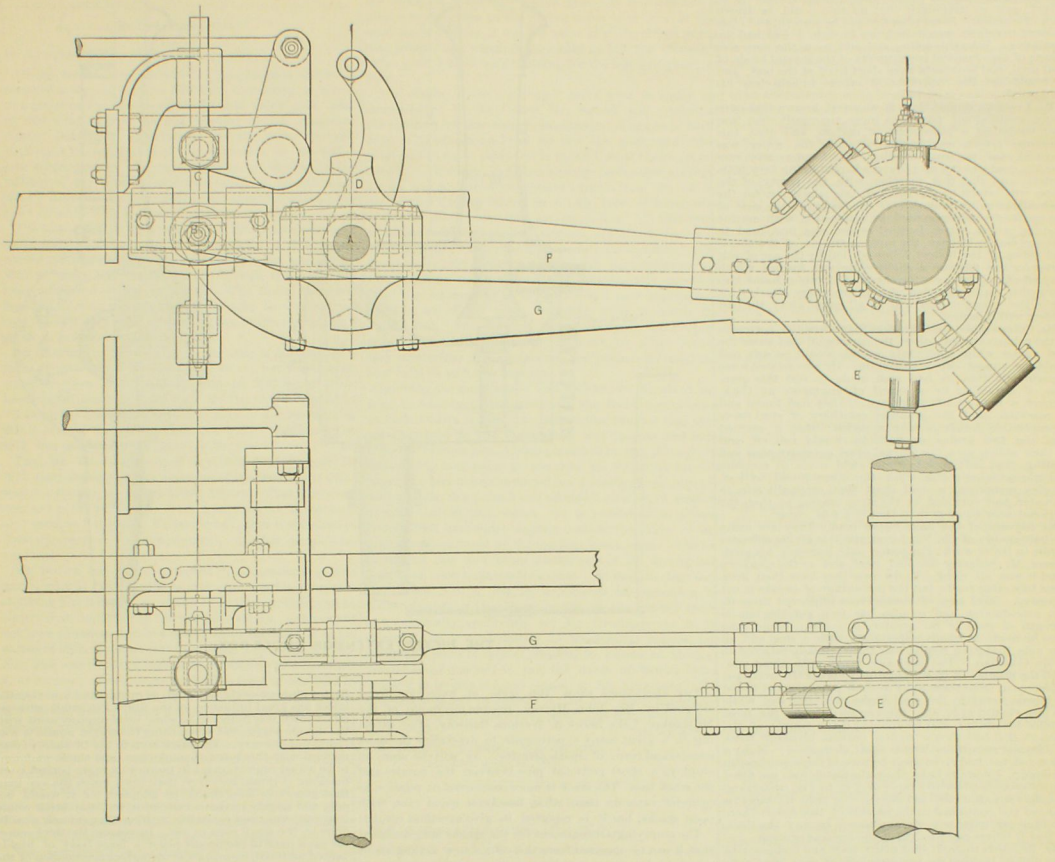
The progress towards improved methods of coal combustion has been slow among us, considering the amount of talk there has been upon the subject. A week ago the writer was at the terminus of a leading road waiting for the train to start, and his attention was attracted to the locomotive at the head of the train by the dense cloud of black smoke she was pouring upon the platform. On going forward to the locomotive a fine engine was seen, with extension front and all the latest appliances contributing to economy and comfort. The fireman had just made up the fire to be ready for a smart run, and a large body of fresh coal was on the fire. The blower was on a little and the air pump was working, so that there was considerable artificial draft. Both dampers were open and the fire-box door was closed. Presently the pop-valve lifted and the steam screamed for three minutes, but the dampers were left open and the door shut, and the smoke continued to roll out of the stack in clouds that might be shoveled. All this time that engine was standing within three hundred yards of the master mechanic's office window.

If the fireman had known enough to close the dampers and open the fire-box door a little, the smoke would have been cleared away and the steam kept down. The question is, Was the fireman or his superior officer to blame for stifling an innocent and long suffering crowd for twenty minutes with sulphurous smoke?

Grade Crossings.

Gov. Harrison, of Connecticut, in his annual message recommends that the Railroad Commissioners be empowered to compel railroad companies to protect their grade crossings. This is a very proper recommendation. Mechanical appliances for the protection of crossings have now been so well perfected that the chances of accidents at crossings protected by interlocking signal and switch apparatus are reduced to nearly nothing. There is no reason why all railroads crossing at grade should not be required to protect themselves properly against accident. The practice of stopping each train before reaching a crossing is one of the clumsiest and least effective precautions ever devised. It well deserves the appellation popularly given to it, of a "know nothing stop."

It would be a hard matter, and would in many instances entail enormous expense, to compel existing railroads to change their grade crossings, so that one road would pass above the other, but new roads ought to be prevented from crossing other roads at grade. When locating engineers know that they will have to pass the roads they intersect above or below grade, they will make their calculations accordingly, and it very seldom happens that they can not find a convenient location for crossing in the proper way. As the practice becomes universal of compelling railroad companies to maintain proper protection at grade crossings, their engineers of location will leave very few of them to be provided for.



WILSON'S LOCOMOTIVE VALVE MOTION.

The new locomotive valve motion shown in the engravings was designed by Mr. William Wilson, Superintendent of Machinery of the Chicago, Alton & St. Louis Railroad, and has been applied to several locomotives belonging to the road. The motion is of the radial gear type, but the movement for the valve is taken entirely from a single eccentric, and its rod fulcrumed so as to produce an ellipse. In the main the device consists of the eccentric *E*, its rod *F*, the reversing gear *D*, and the upright actuating rod *C* attached to the rock-shaft operating the valve rod. The motion is taken from the eccentric, to which is attached the fulcrumed rod, the fulcrumed bearing *A* passing over or through guides in the reversing shaft, which is supported on the radius bar *G* to equalize or correct the inequalities of the motion caused by the up and down motion of the driving boxes in the pedestals while running over uneven track. This shaft is held in boxes, and is connected by an arm to the reverse lever, and can be partly rotated in its bearings by the movement of the reverse lever. While the reverse lever is in mid-gear the guides on this shaft stand in a horizontal position, and therefore the fulcrum of the eccentric lever travels in a horizontal direction. Any movement of the reverse lever back or forward throws the guides on the reversing shaft out of the horizontal position, and at an angle either one way or the other. The direction in which it is thrown controls the direction of the movement of the engine, and the distance it is thrown controls the travel of the valve. The rear end of the eccentric-rod has the same motion as the eccentric, and the forward end or point *B* describes an ellipse whose length corresponds with the throw of the eccentric, and whose diameter is regulated by the position of the reverse lever. The smallest diameter of the ellipse, or that described when the reverse lever is in the center notch, must be twice the lap and lead of the valve.

When the piston of an engine equipped with this gear is on the dead center, an imaginary line passing through the center of the eccentric rod fulcrum would also pass through the center of the reversing shaft. Therefore, any movement of the reversing shaft on its axis would not stir the eccentric-rod, and a constant lead is maintained, no matter where may be the point of cut-off.

The special merits claimed for the motion are quick opening and closure of ports, a constant lead, a correct and equal cut-off, exhaust opening and exhaust closure and protracted release while cutting off early. All the parts of the motion can be finished by machine tools, and has been, so that it is cheap to make.

New England Railroad Club.

The regular meeting was held at the rooms of the Club, in Boston, on Wednesday evening, January 13, Mr. J. W. Marden, the president occupying the chair. The subject for consideration was the

RELATIVE MERITS OF STEEL AND IRON FOR LOCOMOTIVE CONSTRUCTION.

Mr. Lauder referred to the extensive uses to which steel has been applied and the exceedingly low price at which it is placed on the market, as one of the factors that has exerted a great influence in favor of its adoption. A number of years ago, when the steel craze first took possession of the railroad world, he had been severely smitten. But in two years the fever had burned itself out, and now there were many places upon a locomotive where he would under no consideration use steel. He would put it in the boiler, fire-box, and tires, but for piston-rods, connecting and parallel rods, crank pins and axles he would always use hammered scrap iron. For tires it is strong, durable and cheap. In boilers he preferred it, but he knew that the use there is not as universal as it is in the case of tires. Here in the East steel is everywhere adopted, but in the West, where the water is bad and impregnated with lime, they have experienced some trouble. Axles of steel are not satisfactory; they heat more readily than those made of hammered iron, and adding to this the greater rapidity of their wear, can not be regarded as safe. It seemed that when steel is subjected to the intermittent strains of tension and compression, it would not stand the same amount of work that iron would. He then produced a couple of crank-pins and a piece of a piston-rod that certainly showed very curious fractures. The crank-pins were main driving pins, and were both broken diagonally from the outer bearing through the collar and into the inner bearings. The metal was of a fine and even grain, and to the naked eye gave no evidence whatever of weakness. The pins, too, labored under the great disadvantage of having no fillets to ease the strain at the collars. Thus they were made in a way that would be considered a mark of weakness in an iron pin, yet when they broke they acted not as the iron would have done in breaking at the shoulder, but directly through the collar. The piston-rod was broken about one inch from the shoulder on the taper inside the cross-head, and about one-half inch from the key-way. Here, again, was a fracture that did not follow any of the rules, as iron certainly would have done, for it yielded not at the shoulder nor through the key-way, where it was weakened, but midway between. For cross-heads and driving boxes, where the form requires a casting, steel like that made at Chester, Pa., and several other places, may be satisfactorily used, as cast-iron is hardly strong enough. This, however, does not in reality appear to be steel, but a very fine grade of cast-iron with a steel surface, and it possesses the peculiarity of being able to run in a cast-iron guide. In Mr. Lauder's experience, one of these cross-heads had never been known to break.

Mr. Coleman corroborated Mr. Lauder's testimony relative to the heating properties of steel, and remarked that in his experience it had been found to be impossible to make a piston-rod wear glossy. Also in the matter of the use of steel for boiler purposes, it is good and works well, but he had found that though it might stand a greater tensile strain than iron, when subjected to a transverse action it would yield more quickly. In this connection he called attention to a curious property of steel, and that is, that when slightly heated it would crack if bent, and in this he was in turn supported by Mr. Lauder, who gave an account of some experiments that he had made on the subject. He took two pieces of steel, one of Otis, and one of Benson, cut strips from each and subjected them to all of the physical tests usually employed in testing boiler steel. He bent them double cold, straightened them out, heated to a cherry red, plunged into cold water, and bent double without their showing the slightest sign of fracture. Then taking strips from the same pieces, he heated them after brightening over a piece of hot iron, to the point where the blue just begins to show, and on bending them both showed a wide fracture long before they come down flat. This action of steel was like that of molasses candy, which may be drawn out to considerable length, but which immediately snaps upon receiving a sharp transverse blow. Some time since he had occasion to turn up some steel shafts four inches or five inches in diameter, upon which it was necessary to cut threads. It was found to be impossible to do this with an ordinary V tool, that the metal would rag out upon the edges, and they were obliged to cut each side of the thread separately. In referring to cast steel cross-heads, he spoke of similar work that is done in Birmingham, which is there called "run steel," and which is merely a good quality of malleable iron.

Mr. Lauder asked for information regarding the relative values of the two metals for use in the construction of

tender tanks. He admitted that he was in doubt, and wanted light. He had found that the inner surfaces were pitted, and so irregularly that no rule could be drawn from the action. Some places would be smooth, and close at hand the sheet would look as though it had had the small-pox. Take this action and add to it the corrosive effects of the chemical constituents of the several kinds of coal used, and the sheets were short-lived at the best, and he would like the experience of others to help clear his own mind.

Mr. Coleman replied that it was well known that pure water would attack pure iron more vigorously than iron that contained a percentage of carbon, and that this corrosive action was increased when the water was warmed, and inquired whether Mr. Lauder was sure that his steel was not of a low grade containing very little carbon, and that this, together with the purity of the water with which he was favored, might account for the pock-marks on his tank sheets. He instanced the case of the surface condenser used in connection with marine engines, where, when distilled water was first used to recompense for leakage, the rapid corrosion of the sheets and tubes of the boilers followed, but by the use of salt water for this purpose a slight scale was formed which very effectually protects the sheet. Old cable chains also show this rapid corrosion of pure iron very clearly; for while the wrought iron will be all eaten away, the cast spiders will be sound.

Mr. Cofran raised the objection that when the corrosion of the cable occurred below the surface of the water the cast spider, while apparently sound, would be soft, and could be almost cut with a knife. He also related some experiments that he had seen made to test this question of durability by a board of engineers at Cork, Ireland, a number of years ago. They had found and so reported, that the granular condition of steel made it impossible for it to take a polish; that it seemed that the few grains or particles would rub off and by their action upon the journal cause excessive wear and heating; that soft metals would yield more to pressure and take a higher polish, while the wear would be less. He also mentioned a steel shaft that, originally 8 in. in diameter, had corroded at the stern bearing so that the sectional area was less than that of a 4 in. circle.

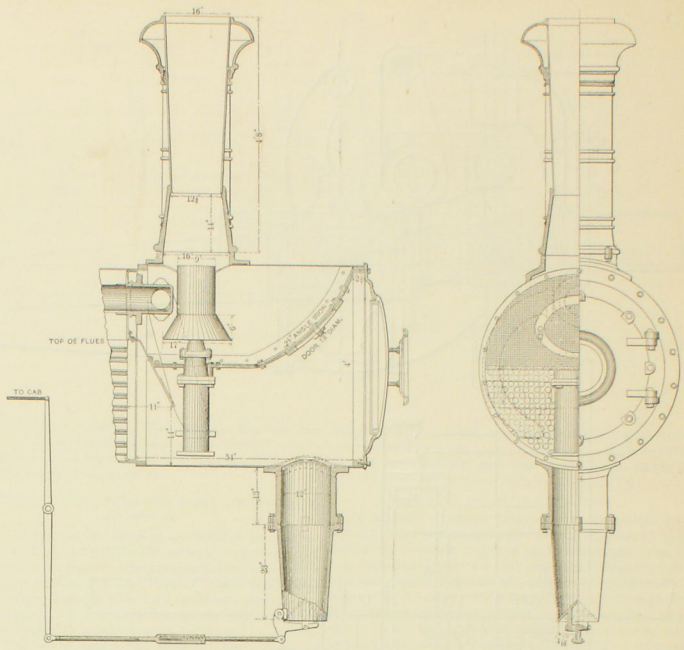
Mr. Stevens, of the Lake Shore road: They are using the best quality of Ch. No. 1 iron, and it is giving splendid results in boiler work. For piston rods, however, his predecessor, Mr. Sedgeley adopted steel, and in the speaker's mind it was all right. To be sure they have their accidents like other roads, but the percentage of breaks is not excessive. Steel has, of course, been improved since its first introduction, and so also has iron, yet the tensile strength of steel is far greater than iron. Some time since he made a rough experiment with a steel and an iron axle that gave results like those already referred to by Mr. Coleman. The steel axle broke with about one-third the number of blows required to break the iron; yet in pieces cut from these axles at their journals, and tested for tensile strength, the steel broke at 80,000 lbs. while the iron yielded at 50,000. Steel seemed to be the most suitable for pistons, and he doubted if the sample of Mr. Lauder's that had shown such a curious breaking freak would stand more than two per cent. elongation. Many a piston-rod, too, had given away because of improper lines in the design. Upon the Lake Shore the piston rods are fitted into the cross-heads with a taper of $\frac{1}{16}$ in. to 1 in.; there is no shoulder, but after the rod leaves the hole its taper is changed and continued to the outside of the rod. There should never under any circumstances be any shoulder, for that is where eight-tenths of the breakages occur.

Mr. Richards thought that many tests and comparisons were unfair, because the performances of poor steel were placed by the side of those of good iron. Thirty years ago 35,000 miles was considered a good life mileage for an iron tire, and even that was rarely reached without two or three resettings intervening; whereas at present 50,000 miles is not an uncommon service for a steel tire before the first turning is demanded. At first the poor steel broke very frequently when used in tires, but a better product has obviated this difficulty. This claim of poor steel as made against American manufacturers of rails, would seem to have some basis from the fact that a large order has recently been placed with foreign makers at $17.00 per ton more than the goods were offered for in the home market, where they have been sold for $28.00, which is far less than the price of iron has ever been. He spoke of an experiment he had made with an iron and a steel axle. The iron one was bent so that the two ends met and no fracture occurred, while that was not the case with the steel. Yet when struck with a hammer at the centre of the curvature the iron snapped, not there, but about six inches from one end. Again, at a later time, the superiority of the steel over the iron in the bending test just reversed the former trial. The advantage for rail use is greatly in the favor of steel. It possesses a harder head, and is not so liable to lamination, and does not beat down like iron. The English obtain very good results by the use of steel in their crank axles, and locomotive drivers have told him that they have never known one to break under a passenger engine. In freight service this does sometimes occur, but it is attributed to the greater number of coupled wheels. Their steel and wrought drivers also give about equally good results.

Mr. Cochran called attention to what is understood as a flexible casting. It was introduced into Sweden about sixteen years ago, and from there it migrated to England, Germany and France. And now works for its manufacture are in process of erection at Worcester, Mass. He had taken a piece of this metal, drawn it out under the hammer until its section area was about one-fourth of the original, heated it, plunged it into cold water, found that it was hardened beyond the power of a file to touch and had then bent it into a U shape without fracture. One peculiarity of the process of manufacture consists in the use of naphtha instead of coal. And if it as much of a success as it promises to be, it is destined to occupy a prominent place in the metallic field of the future.

Mr. Griggs gave some testimony as to the use of steel for crank-pins. He has some of Krupp's make, but although he considers them stronger than wrought iron of the same size, he does not allow them an excessive life before they are knocked out and replaced; and he attributed the heating of steel axles to their want of porosity.

Mr. Adams spoke of the Bemis journal box that he is using, and said he expected to see some beautiful specimens of polished work when the axles were removed. They have already run 45,000 miles, and he expects them to make 75,000 before they are taken out.



THE HICKEY EXTENSION SMOKE-BOX.

THE engravings show the style of extension front adopted by Mr. John Hickey, master mechanic of the Milwaukee, Lake Shore & Western Railway, after carrying on a great many experiments to determine the most economical form of spark arrester. As will be seen, he employs a short petticoat pipe between the nozzles and the stack base. The stack is more contracted in relation to cylinder capacity than what has been usual even with open stacks, but it is reported to give excellent results.

The emptying arrangement for the sparks is so designed that it can be operated from the cab, a new arrangement which is also reported to be a success.

Improving the Locomotive.

THE HICKEY EXTENSION SMOKE-BOX.

In reply to a letter addressed to Mr. John Hickey, master mechanic of the Milwaukee, Lake Shore & Western Railway, asking for some particulars of the experiments he made to find out what form of draft appliances were most conducive to economy, we have received the following interesting and valuable letter. It would be good for railroad companies if many more experiments of a similar kind were carried out with as much intelligence:

To the Editors of the National Car-Builder:

The shape of the stack shown in the blue print sent you [see accompanying cut of same] was reached after a series of experiments. An extended front end similar to that shown in the drawing was constructed and used in connection with a straight smoke-stack, the diameter of which was about that of the engine's cylinder. Although the engine was an excellent spark arrester after the change, she was not a free steamer. Enlarging the brick arch in the furnace, and adding a deflector plate over the door inside, although doing away nearly altogether with black smoke, made but little improvement in the engine's steaming. Leaving the situation as stated, we placed a ring about three inches thick in the inside of the stack at a point near its base, reducing its bore at that point from 16 to 14 inches. With double nozzles, small petticoat pipe, as shown, and ring in stack as stated, the engine steamed much better. We then tried a single nozzle with the other appliances the same, and slightly better results were obtained. I then enlarged the stack at the top, commencing the taper at or near the ring. With this change the stack was 14 inches diameter at base and 18 inches at top. This form showed a marked improvement in her steaming, so much so that the engineer said she could not be bettered. Finding a reduction in the stack diameter an improvement, however, I continued the experiments, and made a stack similar to that shown in the drawing, except that the contracted part was 14 inches diameter. With this form the engine burned a nice even fire and steamed well. I therefore increased the diameter of the nozzles and decreased the diameter of the stack to 13 inches, which point I found by further experiments to be the best for a 17-inch cylinder. Engines with 16-inch cylinders do best with the base of stack 12¼ inches diameter.

With this form of smoke-box and stack, we use single nozzle 4¼ inches diameter for 17-inch cylinders, and a nozzle 4 inches diameter for 16-inch engine. In all cases the smoke-box must be perfectly air tight, and the deflector plate properly adjusted, as raising and lowering the latter has great influence on the fire. The small petticoat pipe shown was found to be some little improvement with the double nozzle, but when using the single nozzle it was found unnecessary. The brick arch in the furnace, in connection with this form of smoke-box and stack, we found to be a vast improvement in promoting more perfect combustion. I think, however, that brick much thicker than that generally used should be adopted, for it would not only add largely to the service of it, but the brick would bear removing and replacing, a thing that cannot now be done by the small sizes in use. Increasing the thickness of the arch puts in the proper place a large body of highly heated material, insuring a more perfect combustion of the gases passing over it, and assisting very much in maintaining an even fire-box temperature.

With a smoke-box and stack as shown, together with a good brick arch in the furnace, and *dampers graduated for the proper admission of air* to suit circumstances, any engine having proper heating surface can be made an unusually free steamer, a nearly perfect smoke consumer and spark arrester, as well as a great economizer of fuel.

Now, while the very best and most careful engineers and firemen cannot accomplish the best results in the way of economy of fuel without the proper mechanical appliances, yet the very best mechanical appliances must result in failure if the enginemen are not educated in the proper principles of combustion, and compelled to follow the directions given them. If engineers, and those who aspire to be such, are made to believe that a perfect knowledge of this subject is absolutely necessary in order to become an engineer of the first class, and that the practical use of such knowledge is one of his most important duties, and this policy is rigidly enforced by master mechanics, enginemen will soon find time to enlighten themselves on this valuable part of their duties.

When it is considered that the fuel used by locomotives is nearly one-fifth of the entire operating expenses of the railroads in the United States, it is easy to see that any saving in this direction is a step in the direct line of economy and well worthy of the attention of railroad companies.

I send you a copy of instruction to enginemen adopted by this road, a copy of which is framed and placed in the cab of each locomotive.

On a subsequent date I propose to take up and discuss "The present form of and benefits derived, if any, from the existing method of getting out locomotive performance sheets."

JOHN HICKEY.

The Worcester Excursion Car Company.

At a meeting of the stockholders of this company held at Worcester, Mass., on Jan. 5, the following directors were elected: H. H. Bigelow, D. H. Fanning, H. C. Graton, C. C. Houghton, Jerome Marble, C. B. Pratt, W. H. Shuey.

At a meeting of the directors held on the same day the following officers were elected: Jerome Marble, President; W. H. Shuey, General Superintendent; C. B. Pratt, Treasurer; A. B. F. Kinney, Secretary.

General Superintendent Shuey reported that the year 1885 had been a prosperous one for the company. A determination was expressed by the officers to take measures looking to a large increase of business during 1886 and the years to follow. It is contemplated to increase the company's present complement of cars from time to time, so as to meet the increasing demand. The operating department will hereafter be entirely under the supervision of the General Superintendent, whose office is at 115 Broadway, New York City.

Communications.

Radial Valve Gear.

To the Editors of the National Car-Builder:

On my return from a somewhat long absence abroad, I received a copy of the CAR-BUILDER contaming a report of a paper on the development of radial valve gear, read by Otto Gruninger at the last meeting of the American Master Mechanics' Association. As the paper covertly challenges the originality of the invention of the valve gear which goes by my name, and is an attack on the validity of my patent, based on a series of mistatements clearly intended to throw dust in the eyes of readers, I beg leave to make a reply, also through your columns.

The concoction of this paper forces me into a position of antagonism with persons to whom hitherto I have accorded nothing but courtesy, and compels me against my will to make statements which, though true, I would have preferred to remain unsaid. The fault, however, does not lie with me, but with those who have raised the dust. I will only refer to such portion of Mr. Gruninger's paper as is directed against myself.

In alluding to Brown's gear, he adds a drawing of a form of gear never patented by Brown, but which is alleged to have been built by him in 1877 on a chain locomotive. (See Figs. 3 and 3 a.) Mr. Gruninger then adds: "I think the gentlemen will have already discovered that this is exactly the gear which two years afterwards, in 1879, was patented in England by Mr. Joy."

That Mr. Brown ever built anything like my gear, in 1877, rests entirely on the assertion of Mr. Gruninger with, may be, the private assent of Mr. Brown. That, however, does not prove anything. Such assertions are as common and usual as "leaves in Vallambrosa" when it is desired to obtain possession, without payment, of other people's inventions.

Mr. Brown has never patented or attempted to patent snch a gear as Joy's, and if he ever attempted to construct anything like it in 1877, or at any other time, nothing can be clearer than that what he did was not a success, or he would not have abandoned it, but would have included it in his patent of 1878. That is a very sure thing. Joy's gear is a success, and was worth patenting by whosoever first invented it, as an army of engineers, including some of the best in the world, will testify. That person was myself. If Brown, in 1877, had accomplished anything near enough to Joy's gear to entitle him now to say anything about having gotten it up, it would have been a success in his hands as it has been in my own, and he would surely have patented it, he being addicted to getting patents on whatever he invents. But whatever he did in that regard, if anything, was certainly abandoned and died out, which is a proof of what he himself at that time thought about the merit of what he did, whatever it was, if anything.

Now, the United States Courts, as I am informed, have frequently expressed their opinions as to such circumstances as these. I read the opinion of one of the Judges as follows:

"How invariable is it, that after an invention of merit has been brought before the world, has become known to the public, and been put in a form to be useful, that people start up in various places and declare that they invented the same thing long ago. These pretended prior inventors had thought of such a thing, had perhaps had a conception of such a thing, but had never carried it out so that the world could obtain possession of it. But when they find that another has completed it they are astonished that they did not see, and think that they must have seen all that is necessary, and then claim that they did invent it. After having seen what has been done, the mind is very apt to blend the subsequent information with prior recollections, and confuse them together. Prophecy after the fact is very easy prophecy."

As I have said, if Mr. Brown in 1877, or at any other time, had been aware of, or had designed such a valve gear as Joy's, and which has proven its merits wherever it has been properly constructed on both locomotive and marine engines, does any one possessed of common sense believe that he would not have patented it, instead of in 1878 patenting or attempting to patent another and different gear, which practically is useless for either of those purposes? I think it is too foolish for belief, and, as it seems to me, the subject is only now brought up for the purpose of scandal. Brown did not describe Joy's gear either in his specifications or drawings, and it is not in any way covered by Brown's patent. Indeed, it requires but a very slight practical knowledge of mechanical science to perceive their dissimilarity. After another practical worker had invented and patented Joy's gear, and had put the world for the first time in possession of it and demonstrated its success in many countries, it is now too late for any one to step up with statements based on such a ground to challenge the originality of the Joy gear.

In Europe, and especially in England, where the building of Joy's valve gear in all the best locomotive and marine engine shops on a very large scale is a matter of very great public notoriety, Mr. Brown has not seen fit to raise any question of the kind. Furthermore, for reasons well known to the law and to Mr. Brown, he has no patent on which he could predicate such a claim, but which subject I shall not now go into. If ever the need arises I can also demonstrate that I designed the Joy gear containing all its present features for overhead marine engines as far back as 1868. I therefore am in a position not only to show that I was the first patentee and therefore the legal owner, but that I was the first to conceive the invention.

Mr. Gruninger, in his paper, had a great deal to say about the so-called "Strong" valve gear. It requires but a glance to recognize in the Strong valve gear one of the least known forms of the Joy valve gear, described in my first patent, and which form, called by him the "Strong" valve gear, I have been building for the last five years at least.

The origin of the "Strong" valve gear is easily accounted for. In 1881, when Mr. Strong was present at the meeting of the British Mechanical Engineers' Institute, at Newcastle-on-Tyne, he saw the gear, and made overtures to me to represent it in the United States on my behalf. I, however, had then already made other arrangements, and he, therefore, obtained terms from me for its use in the United States on a new type of locomotive which he said he was then contemplating. At that time, as he has published in the *American Machinist*, he "had not commenced his investigations into locomotives." He then received from me tracings and all particulars of my valve gear up to that date, and subsequently procured from me tracings of all advances and new applications made by me of my gear, including what is called the "sling link" and "sword arm" designs, whereupon, armed with that information, he next, by some means very mysterious to me, procured new patents thereon, and now calls those forms his own.

Ignoring the more simple and well-known forms of my gear, he has sought to appropriate the more complicated and less known forms, notwithstanding the fact that they are described in and claimed by my patents, and have from the earliest period been published by me throughout the world, long prior to the time at which he himself admits he had not commenced his investigations into the subject. On this point I call attention to a cut of engines of mine built in 1881, which cut is published in *Power*, March, 1885, and which engines contain the form of my gear as appropriated by Strong four years later. The exposure of this and other similar acts of Mr. Strong has, doubtless, been unpalatable to him. At first, in *American Machinist*, Nov. 4, 1884, he announced his intention to write a paper on the Development of the Radial Gear, but, eventually, apparently set Mr. Gruninger to do it, ostensibly as a contribution to mechanical science, but really as a piece of special pleading in excuse of Strong's practices and conduct to me, the name of Brown being dragged in to give color of reason to his argument. Mr. Strong's so-called valve gear is but the most bare-faced and palpable infringement of mine, and will be treated as such by me.

DAVID JOY.

8 VICTORIA CHAMBERS, WESTMINSTER,
LONDON, Dec. 31, 1885.

Lead of Valves.

To the Editors of the National Car-Builder:

I notice in the CAR-BUILDER each month that something is said about lead of valves and economical distribution of steam in the locomotive. Some think stationary lead the best and others prefer shifting lead. The writer has had considerable experience with both motions, and is of the opinion that the shifting link lead is the best of the two, but they are both very defective for a locomotive. If trains were run with the same load and the same speed all the time, then the stationary link, properly proportioned, would be all that could be desired, but that is not possible, hence the valve motion of a locomotive should be as changeable as load or speed of train, and quantity of steam being used. This cannot be done with either the shifting or stationary link. Shifting lead and exhaust is what is needed for different speeds, and this should be independent of the reverse lever and quadrant, and operated as a separate motion in the valve, and this may be done in several ways.

The new valve motion mentioned by you in your last issue is an attempt to get over the above mentioned errors in the link motion. In my opinion it is a move in the wrong direction so far as the lead is concerned, for the motion gives stationary lead for all quantities of steam and speed of train. Shifting lead and exhaust is what is wanted in the locomotive.

G. SHANE.

EAST ST. LOUIS, ILL., Jan., 1886.

[Our correspondent will find it much easier to find fault with what is really a splendidly worked out motion, than to give particulars of any thing likely to work better.—EDS. CAR BUILDER.]

Car Seats.

To the Editors of the National Car-Builder:

I have read with some interest the report of the proceedings of the New England Railroad Club, as reported in the January CAR-BUILDER, and I wish to say a few words about the paper read by Mr. Forney on car seats and the discussion thereon. The purpose of railroad clubs, as I understand it, is to bring together men engaged in similar railroad work, and give them opportunities for discussing subjects of mutual interests, that increased knowledge may be gained from interchange of facts and expressions of opinion; the underlying desire being to make the members more efficient officers and thereby promote railroad interests.

Instead of furthering railroad interests, this paper on car seats is calculated to exert a most mischievous influence against them. There are things about railroads that the public is far from being satisfied with, but the condition of the ordinary car seat is not one of them; and it seems to me a most reprehensible proceeding, that railroad officers should spend hours abusing car seats and arousing people to be discontented with them without any cause whatever. If any of the men who took part in abusing car seats will travel constantly for a month, I do not believe they will hear two complaints about the seats, unless they happen to meet a couple of cranks with jaundiced views of earth's institutions generally and of railroad institutions in particular, when there will be an abundance of abuse of every thing within sight of a car. If car seats were made specially to take care of the angularities of such people's anatomy, nothing could be done to sweeten their dispositions, so the work of trying to make them comfortable would be lost labor. Railroad companies have displayed great solicitude in promoting the comfort of passengers in every way, and no reasonable expense has been spared in doing so; but they can not be expected to go around to make provisions to meet the caprices of whimsical people who find nothing but misery in conditions where the rest of mankind are comfortable and happy.

SUPERINTENDENT.

Dialogue About Car Wheels.

To the Editors of the National Car-Builder:

The following dialogue between a general manager and purchasing agent hits at an evil of giant proportions now afflicting railroad management like a "craze." You, with all true friends of railroads, have been lifting your voice against it. By publishing this little colloquy you will help to open eyes that are now blinded.

TWO OF A KIND.

Scene, General Manager's Office.

G. M.—Call in the Purchasing Agent.

(Enter Purchasing Agent.)

G. M.—Why did you buy those cheap wheels?

P. A.—Because you ordered me to do all in my power to reduce expenses. Why do you ask?

G. M.—Look at that telegram. A $5,000 wreck and one brakeman killed, all by the breaking of one of those confounded cheap wheels.

P. A.—I have a three years' guarantee on all those wheels.

G. M.—What does your guarantee amount to? How much have you saved by buying those cheap wheels?

P. A.—About $500 in all.

G. M.—I thought you had better sense. This one wreck has cost ten times more than all you have saved, and if the lawyers find out that you have been buying cheap wheels we will have $10,000 to pay for killing that brakeman.

P. A.—Was it any worse for me to buy cheap wheels than it was for you to buy cheap cars. Our master car-builder says that the side tracks are full of bad order cars awaiting repairs, from that last lot of new cars which you bought so cheap.

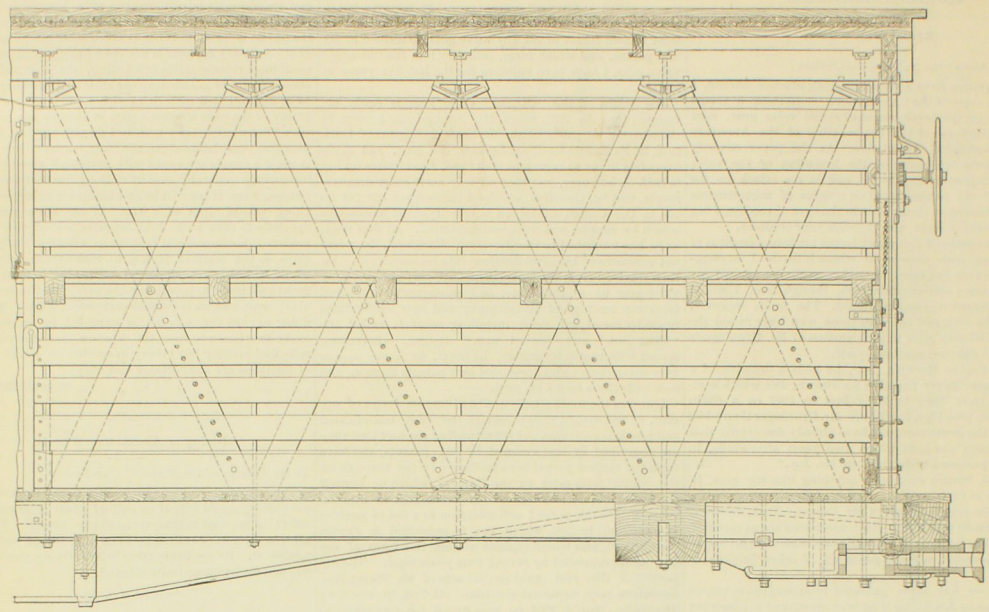
G. M.—That was a bad go, and I dread to meet the master car-builder, for he warned me against accepting the lowest bid, and urged me to order the cars of a shop which builds no cheap cars, and assured me that the best cars always proved the cheapest in the end. But I thought a good inspector at the shops could prevent the use of bad material, but I have found out my mistake, and I am ashamed to visit the shops, for some new defect is developed every day in those infernal cars. If you and I had caps and bells we would be a pair of precious fools well met.

REPAIRER.

New England Railroad Club.

At the next meeting of this club, which will be held in Boston, Feb. 10, the subjects named below will be discussed. Master mechanics, car-builders, engineers, roadmasters and others interested in these questions are invited to be present.

ROLLING STOCK.		ROADWAY.
Gauge of wheels, maximum and minimum limits each side of flange.	1	Gauge of track, spacing of frogs, throats and guard-rails.
Shape of flange and tread.	2	Section of rail.
True centering of wheels, accurate fitting and mating.	3	True surfacing of track and alignment; true gauge and support of joints.
Neglect and repairs of wheels; sharp flanges; flat wheels.	4	Neglect of track; side-track, switches and frogs.
Length of wheel-base and leeway.	5	Proper allowance for wide gauge and sharp curves.
Independent wheels or slipping.	6	Wear of the surface of rails, effect of sand, etc.
Imperfection of center motion of trucks.	7	Trouble with frogs and switches on sharp curves.
Effect of the brakes.	8	Wear of the rails.
Car dimensions, width at different heights.	9	Space between tracks and outside of rail.
Car dimensions, length and width.	10	Effect of curves in modifying space for cars.
Car dimensions, height.	11	Maximum head-room afforded above the rails.
Concentrated weight on car truck, axle or wheel.	12	Weight of rail; strength of bridges.
Room for increase and economy of same.	13	Engine weight as a maximum per cent. wear of engine.
Use of middle truck or three-point bearings.	14	Effect of curves, grade changes and bridges.



FREIGHT CAR HOWE TRUSS FRAMING—PENNSYLVANIA RAILROAD.

The style of framing shown in our illustration is an adaptation of the Howe truss, so much used in bridge work, and was designed for car framing by Mr. John W. Cloud, engineer of tests of the Pennsylvania Railroad. A large number of the cars with framing of this kind are in service, and they have given entire satisfaction under severe tests. It is expected that they will be particularly durable under heavy loads. The framing is designed so that the work is all done to templates in the planing mill. The braces and counter braces are all cut to one template and are made of the same size throughout.

The Law of Car-Trust Securities.

At the eighth annual meeting of the American Bar Association, a paper on this subject was read by Francis Rawle, which has since been published in a pamphlet. The following is a synopsis of his views:

The class of railroad investments popularly known as "car-trust securities" has within a few years grown into extreme importance. Probably not less than $40,000,000 is now invested in that way. The general plan of these securities involves the organization of a joint stock company to furnish the funds for building rolling-stock for railroads. The cars, when finished, go into the hands of the railroad company, subject to a lien in favor of the "car-trust company" for the moneys advanced. This lien is created in a variety of ways, and the legal effect and validity of such lien is the principal subject of litigation concerning these securities.

The peculiar forms assumed by these contracts are to be accounted for by the attempts of their framers to evade certain well-defined rules of law. In illustration of the origin of such securities, the "Railroad Car-Trust of Philadelphia" is in point. This was the earliest instance of the modern car-trust. The courts of Pennsylvania had decided that conditional sales of chattels were invalid as against third parties; between the vender and the vendee the title might well remain in the vender, but creditors of the vendee were justified in treating the property as his. To evade the effect of these decisions, the contract was drawn for the railroad car-trust in the guise of a bailment to the railroad company for hire, with an option in the bailee to purchase outright at the expiration of the time for which the car was "hired."

This experiment, made in the year 1868, was widely imitated. A joint stock company would furnish the funds, build or buy the cars, and convey the legal title to a trustee. The trustee would "loan" them to the railroad company, which agreed to pay for them in installments. Usually the title was to remain in the trustee until full payment of the price, when it was to pass, either *ipso facto* or by means of a bill of sale, to the railroad. Such is the general scheme. One frequent variation is where the railroad itself contracts for the building of the cars and borrows money from the Car Trust Association. In this case the railroad itself causes the title to be vested in the trustee. Sometimes, again, the railroad builds the cars, and, for the purpose of raising funds, transfers them to a trustee, who at once re-transfers them to the railroad under the usual contract. Whatever form may be adopted, the trustee is empowered to retake the rolling stock if default is made in the payment of any installment. The most approved provision for enforcing this lien is one empowering the trustee to sell cars so retaken, and, after deducting the amount of the unpaid installments, to return the balance to the delinquent railroad.

As to the legal effect of such agreements, it is to be noted that the courts have generally refused to construe these contracts according to the language used for the purpose of evading settled rules of law, and have sought to educe the real motive and spirit of the contracts. The ostensible form of a bailment has, except possibly in Pennsylvania, been rejected, and though the car trust company purports to loan or hire out its cars, the contract has been construed almost uniformly as either a conditional sale, valid or void according to the general rules governing conditional sales, or as an absolute sale with a resulting lien in the nature of a mortgage in favor of the vender. No matter what words are employed, the transaction is a sale and not a bailment, for the thing itself and not the mere use of the thing, is what is really stipulated for. The title, however, may or may not pass before the full payment of the purchase money, according as the sale is absolute or conditional.

By the old common law conditional sales are perfectly valid as such, even against the creditors of the vendee or purchasers from him. The title rests in the vender, and no one can impeach it. This ancient rule is followed by the decisions of most of the States, including New York, Ohio, Iowa, Michigan and Massachusetts. In several of these States, however, the rule thus established by the courts has been altered by statute in favor of the creditors. Apart from these there are a few States—chief of which are Pennsylvania, Illinois and Kentucky—where the courts themselves have sustained the claims of creditors and purchasers from the vendee as against the title retained by the vender. These decisions, like the statutes, are calculated for the security of creditors. Where the title is held to pass at once and only a lien to arise in favor of the vender, the mere language is brushed aside, and the substantial transactions held to raise a lien in the nature of a mortgage.

Except under peculiar circumstances the contract is usually interpreted as a conditional rather than an absolute sale, and on general principles in many States would not prevail against creditors and purchasers of the vendee. Statutes, however, have generally made an exception in the case of rolling-stock, so that by recording the contract and marking the car the title of the vender will be protected. The statute of Illinois was the first of this kind, and it has been generally followed. When the terms of these statutes are complied with the vender is, as a general rule, protected against judgment creditors and subsequent purchasers of the vendee.

The most important question in this conection is with reference to the rights of prior mortgagees of the railroad under a mortgage securing them a lien upon all "after-acquired property." Generally it is held that such mortgagees can only take the rights which come to the mortgagors, subject to all equities and liens of other parties. When the contract is deemed a conditional sale the railroad takes only a qualified title; when it is deemed an absolute sale, the resulting lien is held to arise from the same transaction, so as to exclude intervening equities. If the railroad itself built the cars and afterwards conveyed them to the trustee of the car trust association, the prior mortgagees might perhaps take precedence under the "after-acquired" clause.

Street Car Propulsion in Britain.

In Britain the expense of horse feed is much higher than it is in America, so that the expense of operating street railways with horses reaches very high. Efforts have constantly been made for years to introduce a cheaper motive power, but this far without success. Steam motors have had a limited application, but the municipal boards object to having them in the public streets, so their use is obstructed by annoying ordinances. When the Portrush electric tramway was opened in Ireland two years ago, it was expected that the experience gained in the actual operation of that road would lead the way to operating ordinary street railways by electricity, but nothing has come of it. The application of electricity to car propulsion is recognized as being still in the experimental stage, and capitalists will not put money into experimental schemes that promise so little financial return. In Manchester, there has lately been considerable agitation in favor of introducing the cable system of street car propulsion. The practical success of this system in San Francisco and Chicago is cited as good reason why it should be introduced into Manchester.

The English engineering world has been familiar with cable traction almost since this century began, and it is surprising that it has not been tried more for street car traction. If we remember rightly, the Blackwall Railway in London was first opened as a cable road some fifty years ago or more. That was a failure, principally through defects in the mechanical details, and the loss incurred by the promoters of the enterprise may have deterred others from entering into similar schemes.

THE *Denver Tribune* says that engine No. 912, of the Union Pacific road, is being fitted up with one of the largest and most effective snow ploughs in the country. The plough weighs four tons, is 12 feet wide and 16 feet high at the wings, and can throw snow 40 feet on either side of the track. This gigantic snow shovel is balanced on the front of the pilot platform, being securely braced by bars running along the frame behind the cylinders, and bolted to uprights reaching to the back of the plough. The shear or edge is some eight feet beyond the pilot platform, and just escapes the rail. This plough is shod heavily with iron. The engine's balloon stack is replaced by an open straight stack, as it was found by last winter's experience that a balloon-stacked engine stood a poor show behind a snow-plough in a heavy drift. This plough killed 36 head of cattle last winter in a cut where they had wandered and were shut in by drifts.

THE Westinghouse Machine Co., Pittsburgh, Pa., are building a furnace to be fired with natural gas, and are erecting a steam-hammer for the die forging of their connecting-rods from mild steel. They are also building a brass foundry for the production of their own castings. Natural gas has been introduced throughout the works.

BARROWS & CO., of New York, have placed orders for 4,500 tons of 60 pound steel rail with the Cleveland Rolling Mills, and five 40-ton locomotives with a leading manufactory, together with frogs, switches, coal cars, etc., to be used in constructing fifty miles of the St. Louis & Chicago road now under way.

THE Shenandoah Valley Railroad Company have fitted up some of their own passenger cars as sleeping cars, pending the withdrawal and replacing of regular sleepers. The temporary sleeping cars have been quite a success.

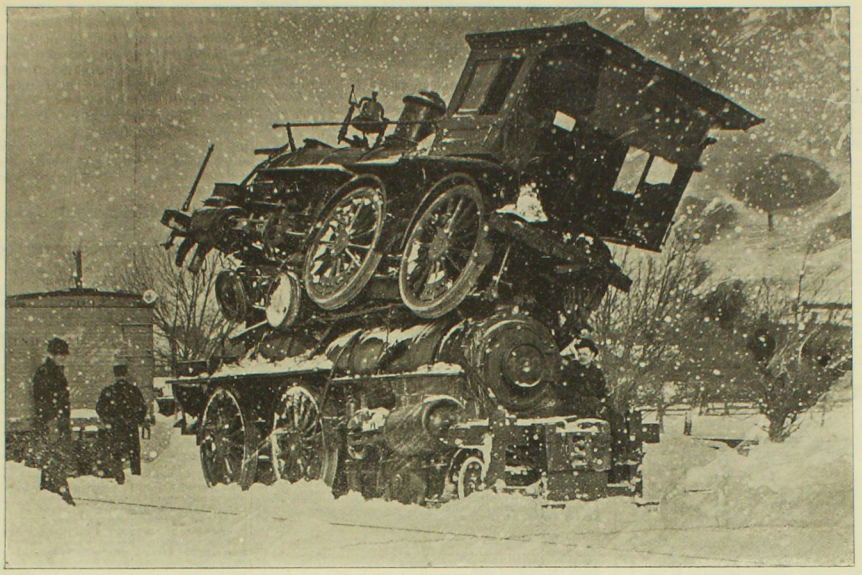
THE Chicago & Northwestern Railway Co. is at present doing more railroad building than any other Western road. New extensions are being built in nearly all directions, but particularly in Nebraska.

THE Buffalo Car Co., whose shops have been closed for several months, resumed work on the first of January, and is filling an order from the Buffalo, Rochester & Pittsburgh road for 200 coal cars.

THE Michigan Car Co., in Detroit, is building 500 freight cars for the Michigan Central road, and is also repairing and rebuilding a large number of cars for the same road.

THE Beaver Falls (Pa.) car works were destroyed by fire January 15. The total loss is estimated at $150,000, including a large number of valuable patterns.

THE Schenectady Locomotive Works are filling an order for fifty locomotives, which will keep the shops busy for several months.



PLOWING UP A LOCOMOTIVE.

The above engraving gives a graphic insight into the amenities of railroad operating during the snow blockades so common on our Northern roads during the terrible winter months. This extraordinary accident happened to the engine of a passenger train that got stalled during a raging snow storm, in a bank three-quarters of a mile from a telegraph station. By some means a misunderstanding arose about how far out the train was, and engine No. 470, having arrived at the telegraph station, was sent to the relief of the embanked train and got into collision with it. This engine was fitted up with one of the heavy iron snow-plows that are bolted on the front truck. The engineer was told that the stalled train was two miles out, and he started to get there through the snow drifts. The usual way is to run the engine as fast as possible, so that deep drifts may be cut through by the momentum the engine acquires on the clear track. While he was rushing along about forty miles an hour through the blinding storm, this engineer suddenly found the other engine close in front of him, and there was no time to slow up before they were together. Engine No. 295, belonging to the passenger train, was struck so hard by the plow that she was scooped up into the position shown. The plow was demolished, and both engines were badly wrecked. As it was very important that the disabled engine should be got off the main line quickly, the broken pipe connections of engine No. 470 were plugged, steam was got up and the engine was run to the side track at the telegraph station, carrying the other engine on top, where the wreck was photographed. The engraving is an exact reproduction of the photograph.

Inventors and Railroad Men.

Bitter complaints are often heard expressed by inventors about the apathy of railroad companies regarding inventions that have been devised for the purpose of improving railroad appliances, or for providing the means of operating trains in a safer and cheaper manner. They say that when an invention is produced calculated to improve the machinery employed by private individuals or ordinary companies, there is no difficulty experienced in obtaining an opportunity to test the value of the invention; but that when any thing of the kind is brought out applicable to railroad machinery, the inventor, in trying to get it applied, is referred from one officer to another, and is often subjected to tiresome delays, uncivil rebuffs and general contemptuous treatment. In many cases these complaints may be well founded, but inventors are by no means the only aggrieved parties in the premises.

Inventions intended for railroad purposes are often difficult and expensive to apply and require skillful supervision to test properly. In many instances they are troublesome to operate and even dangerous, yet the inventor never thinks these drawbacks should prevent a railroad company from trying a device which he alone conceives to be an improvement. But the great trouble is, that a multitude of inventors are yearly rejuvenating ancient devices that have been found worthless many years ago, and which are perfectly familiar to the men of experience in charge of railroad mechanical departments. An ingenious man who knows he is possessed of inventive faculties, readily imagines the railroad field is open for his industry, and he proceeds to invent appliances he supposes ought to be in demand. For instance, one perceives that locomotives still continue to throw sparks, and he gets figuring on how this could be prevented in a better way than by the ordinarily used appliances. It is no very difficult matter to hit upon something not in use which seems feasible. He gets out a drawing and takes it to a patent lawyer. This gentleman on examination finds the leading idea as old as the hills, but he knows his business and secures a patent on a combination. When the inventor, fully protected with letters patent, applies to a master mechanic for permission to try his device, he is indignant on being told that the invention had been tried years ago and was no good, and does not believe a word of it. It is natural that an inventor should be surprised to hear that an appliance which he worked out of his inner consciousness was old, but such coincidences of invention are very common, and railroad mechanical men are so much importuned to try devices of the kind that there is good excuse for their not being very patient in listening to the inventor's extravagant estimate of the savings of all description that the invention will effect. It is too often much easier to figure up the savings that an invention will effect before it is applied than after it has been in service.

The men who reinvent old devices are deserving of sympathy for unknowingly wasting ingenuity, but the ordinary patentee who rejuvenates old appliances does not do so ignorantly. There are a good many railroads who are paying royalty on inventions that were public property long ago. Inventors of that class can not be too rudely treated.

Lively Inquiry for Car Lumber.

The *Northwestern Lumberman* of Jan. 16, in commenting on the state of the lumber marked at the Chicago yards says:

"The feature of trade now interesting the dealers is the lively inquiry for car stuff and the apparent scarcity of it. In the matter of Norway car sills there seems to be fairly lively doings. Buyers are picking up all they can find, and at greatly advanced prices. Stuff that sold a short time ago at $14.50 a thousand has lately changed hands at $19, and it is insisted that good Norway car sills are worth $20 a thousand. This up-jump in prices has resulted in increased demand consequent on the revival of car building. Nearly every factory now has orders to fill, and more in prospect. The demand has come so suddenly that the Michigan mills were unprepared for it, and are now not equal to the emergency. Buyers are resorting to the wholesale yards here for what they cannot procure at the mills. What is characteristic of the demand for car sills is also is a measure peculiar to car siding and decking just now. There is a brisk inquiry all over the district for both soft and Norway pine strips for car building. A and B flooring in white pine are the grades mostly used in car construction. The stuff required is, however, short lumber, five and eight feet long, mostly the former. The stock has already been so nearly bought up that cutting of longer lengths will have to be resorted to, which will tend to still further stiffen prices, which are already on the advance. It is claimed that short stuff is now worth $2 a thousand more than it was before the new demand sprang up.

"This revived inquiry for lumber that enters into car building affects but a small portion of the stock carried in the yards of this city, but is an important feature of current trade nevertheless, because it is a pointer to the change that is taking place in railroad business. For the past two years railway improvement has been at a standstill, and this deleteriously affected the lumber trade in various ways. The fact that now there is increased inquiry for car stuff shows that new rolling stock must be added to the roads to furnish extensions as well as to replace the old cars that have been worn out. This new demand is also evidence that a period of construction is beginning, so that what is now but a little shower will grow into a sweeping demand in the near future."

The Development and Economical Management of the Locomotive.

On the evening of January 25th, Mr. Angus Sinclair of the NATIONAL CAR & LOCOMOTIVE BUILDER, talked on the above subject at the Kinzie Street Railroad Men's Reading Rooms, Chicago.

The growth of the locomotive was traced step by step and the work of American mechanics and inventors in developing the engine was investigated. All types of early locomotives that railroad men are now interested in, were illustrated by magic lantern views, full explanations of the object or aim of the various designs being given. Oliver Evan's work on the high-pressure engine was explained and illustrated, Peter Cooper's small engine was shown, and the labors of James, Jervis, Baldwin, Winans and others, received attention.

Many of the efforts made to obtain increased work from the steam used in locomotives were explained, and views of the Webb compound locomotive, the Strong valve arrangements on an engine built by Mr. Mitchell, of the Lehigh Valley Railroad, the valve gear used by Mr. Stevens on his Mastodon locomotives, and the motion recently put in service by Mr. Wilson, of the Chicago, Alton & St. Louis Railroad, were given, and all of them excited profound interest. Indicator diagrams were used to explain in what way steam was lost or saved by various methods of handling the locomotive.

To illustrate the subject of coal saving, a view of a locomotive fire-box was given, and the lecturer explained by its aid the principles of combustion. He explained in what way great quantities of heat might be lost or saved by the ignorance or skill of the fireman, and the cause of smoke was clearly stated, with the simple means that might be employed to prevent the nuisance and source of heat waste. The rooms were crowded with train men, and many railroad officers were present, all of the audience manifesting warm interest in all the subjects introduced. This was the first of a series of talks on railroad subjects by practical men.

Mileage of Pennsylvania Railroad Locomotives.

When we were searching for information relating to the durability of the American locomotive, we applied to Mr. T. N. Ely, General Superintendent of Motive Power of the Pennsylvania Railroad, for some data respecting the mileage made by the locomotives belonging to his road, and in reply received the following communication and statements:

I herewith inclose two statements which I think will supply the desired information concerning the durability of American locomotives.

The locomotives in the first table were taken from those having made their mileage on Pennsylvania Railroad Division, covering service on long and short runs of main line and branch roads, and are about 60 per cent. of the whole number in service. More locomotives might have been added, but these were deemed sufficient to establish their general efficiency.

As to the time locomotives are taken into the shop for general repairs this cannot be stated very definitely. We may say in a general way that with the large mileage performed by our locomotives they are taken into the shop for general repairs at intervals of say 18 to 20 months.

The locomotives making the highest passenger mileage, namely, 780,182 miles, and the highest freight mileage, 561,139 miles, are both still running and in good order.

On the second sheet you have a few special performances of locomotives taken from our records, which will be of interest to you as bearing upon the same subject.

THEO. N. ELY,
General Superintendent M. P.

Length of Service and Mileage of Locomotives on Pennsylvania Railroad Division to January 1, 1885. For information of National Car-Builder, New York:

PASSENGER LOCOMOTIVES.

No. of Locos.	Years in service.	Aggregate mileage.	Highest mileage.	Lowest mileage.	Average mileage per loco.	Average mileage per locomotive per year.	Still in service.
2	8	725,943	381,563	344,380	362,972	45,372	2
7	9	2,114,059	345,245	248,278	302,094	33,566	7
3	10	844,940	294,465	263,969	281,650	28,165	1
8	11	2,535,864	388,895	247,444	315,721	28,702	7
6	12	2,345,275	562,954	306,604	390,879	32,573	3
3	13	1,105,593	428,135	318,843	368,531	28,349	1
11	14	4,413,143	613,035	285 571	401,195	28,657	9
7	15	3,381,456	588,686	396,813	483,065	32,204	7
9	16	4,419,182	780,182	351,308	491,020	30,689	8
5	17	2,679,123	687,979	431,440	535,827	31,519	4
4	18	2,236,827	647,100	488,457	559,207	31,067	3
65	13	26,792,024	780,182	247,444	412,185	31,707	52

FREIGHT LOCOMOTIVES.

33	5	5,323,356	196,507	130,403	161,314	32,263	33
23	6	4,055,956	219,036	147,035	176,346	29,391	23
10	7	2,499,319	279,135	191,505	249 932	35,705	19
13	8	3,402,401	280,130	202,233	261,723	32,715	13
27	9	7,374,779	314,284	224,690	273 140	30,349	24
15	10	3,895,911	316 861	200,983	259,727	25 973	11
12	11	3,440,382	415,558	201,759	286,698	26,063	7
43	12	12,988,691	454,144	205,875	302,063	25,172	29
44	13	13,971,113	440,477	235,029	317,525	24,425	32
36	14	12,204,447	425,786	244,095	339,012	24,215	15
26	15	9,829,709	561,139	271,052	378,066	25,204	14
21	16	8,241,872	531,650	270,879	392,470	24,529	12
16	17	6,347,582	485,087	324,925	396,723	23,337	8
17	18	6,309,479	429,713	307,515	371,158	20,620	12
2	19	750,797	399,663	351,134	375,398	19,758	0
4	20	1,752,399	519,263	378,440	438,100	21,905	1
3	21	1,180,196	464,094	353,869	393,399	18,733	1
4	22	1,644,176	431,485	387,126	411,044	18,684	0
349	13½	105,212,717	561,139	130,403	301,469	22,331	245

Special Records of Performance of Locomotives, Pennsylvania Railroad.

No. of Locos.	Placed on road.	Mileage between time in shop. Date.	Mileage.	In shop—Gen'l Repairs. Year.	Amount.
273	Sept., 1875	Fr'm Sept., 1875, to Aug., 1880	251,552*	1880	$3,000.00
		" Aug., 1880, to Feb., 1883	67,840	1883	1,500.00
		" Feb., 1883, to Dec., "	62,171	1883	1,300.00
		" Jan., 1883, to May, 1884	50,093	1884	1,722.96
		" May, 1884, to July, 1885	41,904	1885	813.46
		" July, 1885, to Sept., "	4,788		
			479,248		$8,336.42
274	Sept., 1875	Fr'm Sept., 1875, to Aug., 1880	243,476†	1880	2,600.00
		" Aug., 1880, to Feb., 1883	138,375	1883	1,223.62
		" Feb., 1883, to July, 1884	70,868	1884	1,930.66
		" July, 1884, to May, 1885	41,434	1885	780.17
		" May, 1885, to Sept., "	10,148		
			504,301		$6,534.45

* This locomotive was not off its wheels during this (251,552) mileage.

† This locomotive was but once off its wheels du ing this (243,476) mileage, due to accident.

Mileage made by One Passenger Locomotive on Pittsburgh Division, June 1 to Aug. 31, 1885, inclusive.

Loco. No.	Date.	Mileage.
1047	June, 1885	13,279
	July, "	14,040
	Aug., "	14,191
	Total	41,510

On Pennsylvania Railroad Division in 1882: 72 passenger locomotives made an average of 45,936 miles each; highest mileage, 79,258; lowest, 30,039.

175 freight locomotives made an average of 36,584 miles each; highest mileage, 58,711; lowest, 30,000.

ALTOONA, Pa., Oct. 3, 1885.

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EDITORIAL ANNOUNCEMENTS.

Addresses.—*Business letters should be addressed, and drafts and money orders made payable, to* THE NATIONAL CAR-BUILDER. *Communications for the attention of the Editor should be addressed* EDITOR NATIONAL CAR-BUILDER.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR-BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

THE OUTLOOK FOR RAILROAD BUILDING.

The indications that the current year will be one of renewed activity in railroad construction are increasing every day. The new mileage of 1885, according to the latest figures, was 2,871 miles, which is less than in any year since 1878, when it only reached 2,629. The total new construction from 1879 to 1885 inclusive, was 46,423 miles, being an annual average of 6,632 for each of the seven years, or 3,761 miles less than in 1885. This, although it proves nothing as respects the future, is a good basis for a reaction, or, as the politicans say, to count gains from.

In view of the increase in population during this long interval, and the extent of territory at the south and west that is waiting to be provided with additional railroad facilities, it would seem that a period of greatly increased construction must necessarily ensue. The fact that some fifty roads went into the hands of receivers last year, and that thirty were sold under foreclosure, is not a discouraging circumstance. Many of these roads were built in advance of their time, and under new organizations will be able to turn to good account a traffic, the growth of which could not be forced but had to be waited for.

Articles of incorporation are being filed in all directions by newly organized companies, especially in the Northwest, and new branches and feeders projected for existing lines. These latter, it is safe to assume, are not speculative enterprises like many of those which contributed to swell the mileage of 1882 to an unparalleled figure, but are, on the contrary, a needed extension of old lines to meet the demands of an increasing and legitimate traffic. It is not likely that all the independent lines projected, nor the half of them, will be carried to completion during the year, nor will the movement run into a "boom" like that of 1880–'81. Capitalists are more wary and calculating than they were, and are likely to discriminate more sharply between good and bad investments.

It is not an extravagant estimate to place the probable new construction in 1886 at 6,000 miles. A revival to this extent, even, means a vast consumption of material and supplies, the employment of a host of idle and waiting laborers, and a stimulus to all branches of industry by a general advance in prices. A significant indication that the long-wished-for improvement is near at hand, is the advance in the price of steel rails from $26 in June last to $35 in January, and the receipt of large orders by the mills both for early and later delivery. The car and locomotive shops are also receiving more numerous and larger orders than at any time during the last three years. Much of this new equipment is, of course, to replace worn-out cars and locomotives, but a very considerable portion of it is called for in anticipation of the new mileage to be added this year.

AMERICAN AND BRITISH LOCOMOTIVES.

We are frequently asked by readers of the American papers if there is truth in their frequently reiterated statements that American locomotives are greatly superior to those of English make. To this we can give, on personal experience, an emphatic denial. Taken as a whole, the American engine is a decidedly inferior machine. American engines have some excellent points. They are free running; so also are our own outside-cylinder engines. The valve gear of all American engines we have seen gives a better steam distribution, as shown by the beat, than the same number of English engines picked at random. Their mechanism is more get-at-able. Having said this there is little more, if anything, to be said in their favor. The connection of parts, such as spring hangers, is very weak, and the use of set screws in place of through bolts is another fault. No doubt such weak connections may serve their purpose in America, where speed, as we know it, is almost unknown, but they would never stand the hard usage of an English high-speed service. Hence it *may* be possible to supply cheaper engines from America to our colonies, where speed is as yet unknown, than English makers can send, adhering to substantial work. Our own experience of the matter is, however, that English engines of first-class express make were delivered in Australia at a far less price than the same class as to weight, cylinder diameter, and number and arrangement of wheels were delivered from America. The English engines were well made in every respect. The American engines were decidedly inferior, and all made for exterior show; the coupling rods, for example, being black on the inside and polished on the outside only. The almost invariable assumption of American writers that there are no outside-cylinder engines in England is too untruthful to require further notice than to say it is just a type of the veracity of their statements. We believe inside-cylinder engines are not to be found in the United States. The reason of this is not that the outside-cylinder is thought to be the best, but simply because the locomotive builders of the States cannot produce a cranked axle any more than they can forge a wheel.

The above remarks were made editorially by the *Mechanical World*, of London, and we believe the occasion that brought forth the observations was not so much remarks in American papers derogatory to British locomotives as the discussion going on in British trade papers as to why American locomotive builders are beating the British locomotive builders in the natural markets of the latter—the British colonies? The easiest way to settle this question is to abuse the parties who prefer American locomotives and make disparaging statements about the locomotives built in this country, but these methods are not likely to injure the business that our locomotive builders are gaining in Australia and New Zealand.

The ordinary American locomotive is not so ponderous as those of British build, but neither are American bridges so heavy or noted for the solidity peculiar to British bridges, but they have the material put where it is required, and this scientific adaptation of sizes and shapes for the purpose in view is pushing the British heavy bridge out of the Colonial market. Our locomotive builders are like our bridge builders, and aim to put the material where it is needed, and the result is a light looking but intensely durable machine. The light connections complained of manage to hang together through an astonishingly long mileage. If any of our makers really were guilty, as the article says, of polishing the outside of the connecting rods and leaving the inside black, they must have neglected the well known admonition against washing only the outside of the cup; but it was not altogether a fatal defect if, as is presumed, their neglect on inside finish did not cause the rods to break. The ultimate test of a locomotive is utility, and the engine that will stand the work best is the machine being preferred. It is useless for our contemporary to say that American locomotives are not subjected to hard usage because the speed common here is not so high as the speed on English roads. It has been proved from daily experience that a very fast through train is not nearly so hard on a locomotive as a fast local train with numerous stops, the kind of run that the greater part of our passenger locomotives are working on. Engines running the Bound Brook and Pennsylvania Railroad fast through trains do not need so much repairs as the engines working the fast locals.

Before the *Mechanical World* accused American writers of ignorantly believing there were no outside connected locomotives in Britain, it should have made sure of not displaying quite as dense ignorance itself about inside connected engines in America. There are many inside locomotives still in service here, and that type of engine was thoroughly tried on this side of the Atlantic. The assertion that inside locomotives are not used because our makers could not forge crank axles, is absurd and very far from the truth, for that form of engine was not abandoned through trouble with the axle, but because the engine as a whole was expensive to keep up, an important matter that does not yet appear to have struck Englishmen in its proper light.

The English locomotive costs more to build, lasts a

shorter time, does its work no better, needs a comparatively straight track to run on, and is much more expense for repairs than the American locomotive, and these are very good reasons why the latter should be preferred. While these differences exist in favor of the American engine, buyers may be expected to exhibit common sense and self-interest enough to purchase the engine that will give them the best return for their money.

NEW YORK CITY PASSENGER TRANSPORTATION.

The problem of passenger transportation in the city of New York is becoming every year more difficult, in consequence of the excess in the number of passengers carried over the increase in population. Within the last ten years the population has increased some 20 per cent., while the travel on the elevated and surface lines has increased during the same period not less than 35 per cent., which is equivalent to an average of about 200 trips or fares per inhabitant for the past year. This is an approximate estimate, but can not be far out of the way. This disproportion in the number of passengers carried and growth of population is likely to continue for some years to come, or as long as the business and resident quarters of the city shall remain substantially as they are now. The residences within the corporate limits are spread over a large area in which the population is all the while becoming more dense, while the extension of the business area is comparatively slow. It is this condition of things which complicates the transportation problem. The present elevated roads can carry a vastly greater number of people than they now do, provided the traffic could be distributed more equally over the four lines. As it is, the two central lines are choked by the rush to the business quarters in the morning, and a similar rush to get away from them in the evening, while the traffic of the two exterior lines running respectively near the North and East Rivers, is comparatively light and practically non-paying.

This state of things arises from circumstances inseparable from the rapid growth of a city limited to a long and narrow peninsula, with room for spreading at the top or upper extremity only. The time, however, will probably come when the present disproportionate increase in passenger journeys and population will be much less than it is now. The business quarters will in time be less concentrated, traffic will be diverted more from the central to the side lines of both elevated and surface roads, and this diversion will doubtless be aided by the construction of elevated cross-town lines, as the extension of the business portions of the city may require. Should the relative growth of population and passenger journeys continue in the same increasing ratio as heretofore, it is manifest that in two or three decades a state of things will be reached that will render any practicable system of surface lines altogether inadequate to meet the demand for transportation, if it is to keep on increasing in the ratio of the number of trips per inhabitant within the past few years.

There is evidently but one way by which the capacity of the present elevated lines can be increased to any considerable extent, and that is to build new and stronger structures that will carry heavier locomotives and longer trains. This, however, would only be a temporary relief if the population keeps on increasing as heretofore, and the resident and business quarters continue relatively as they are now. It is clearly manifest that no system of surface lines will meet the requirements of the future, and that the only alternative is a gigantic underground line, or system of lines, from the lower extremity of the island to Harlem River. The cost of such a work will be enormous, but aside from rock-cutting and deep excavations, it is no more impracticable than the Metropolitan system of London. It would be for the use and benefit of posterity, and upon them the burden of cost should mainly be imposed.

THE FREIGHT CAR BRAKE QUESTION.

As was intimated in our last issue, the Committee of the Master Car-Builders' Association, appointed to investigate the subject of Automatic Freight Car Brakes, arranged to hold a meeting at Harrisburg, January 6th, for the purpose of consulting with the owners of power brakes with the view of arranging for instituting brake tests on a basis agreeable to all parties interested therein. The meeting was duly held, and particulars are given in another column. It has been arranged that public tests of all brakes entered shall take place at Burlington, Ia., on July 13 of this year, that the cars equipped with the brakes shall then be put in service and kept running till the April following, when they will be collected at Burlington and tried again without being repaired or put in shape for the test. This, we consider, will provide a very fair test of the various brakes, since it will show exactly how they pass through the ordeal of actual service.

The only matter for regret about the proposed tests is, that they are so long delayed. An effort was made to have the first tests carried out before the time of next meeting of the Master Car-Builders' Association, but some of the brake owners objected that they could not be ready by that time, and the chairman of the committee insisted that no action should be taken that would be calculated to exclude any brake from the test; so July was agreed upon. However much it may be regretted that the action of the association on freight car brakes is delayed for a year, it is certainly better that this delay should be endured than it would be to rest under the charge that any brake was excluded from trial by the precipitate action of the committee. The freight car brake question has ripened very rapidly in the last three years, and many railroad companies which five years ago ridiculed the idea that continuous brakes would ever be applied to freight trains, are now convinced that the change is merely a matter of time, and are considering what brake is likely to give them the best service for the money invested; so that the teaching of the coming tests is likely to receive wide practical application. Any thing that would throw doubt on the fairness of these tests would be an injury to brake owners, railroad companies and to humanity, by tending to delay decisions to adopt efficient freight car brakes.

Among those who have not seen freight cars equipped with power brakes handled in service, an impression prevails that great difficulty will be experienced in getting the brakes operated during the months of the durability test. They suppose that the cars equipped with power brakes will get swamped among the multitude of cars that have merely the old hand brake. There will be no trouble of this kind if the roads where the brakes are running handle them properly. When the Chicago, Burlington & Quincy first applied power brakes to twenty-five cars, these brakes were made to do the braking of six trains, and four of the cars were always kept together. They were put in through service between Chicago and Denver, and there never was the least difficulty experienced in keeping the record of cars. We understand, had the first plan of tests proposed by the Master Car-Builders' Association Committee been accepted by brake owners, that the cars would have been run in groups to do the braking, just as the companies' own brake cars had been run, and there is no reason to doubt that they would have all been treated with perfect fairness. A similar plan will have to be adopted wherever the cars are run during the coming tests, and it will be necessary that some supervision is exercised over them to see that they are kept at work.

Slip of Locomotive Drivers.

Some of our friends of the *Railroad Gazette* are badly exercised over a statement made in a paper read before the last meeting of the American Society of Mechanical Engineers, in which a belief was expressed that the slippage of locomotive wheels is not less than one-fifth of their circumference in each revolution. That statement is a manifest exaggeration of facts, and as such is open to criticism, but it scarcely distorts them more than is done by an editorial that appeared in the *Gazette* some time ago, announcing the astonishing discovery that there is no slip whatever to the drivers of American locomotives. The writer of the article in question had not investigated the subject, and evidently had no personal knowledge of what he was piling up a complete mountain of words about, but he had heard that two youths made some experiments with a locomotive, and found no slip to the drivers; so he rushes into print to assure the engineering experts of America and Europe, who had by experiment and experience come to the conclusion that the drivers slipped more or less when a locomotive was working, that they were all wrong. To be sure, "the tall towers of assertion on slim foundation of fact," to quote the writer's own words, merely elicited smiles of derision from the mechanical railroad men who happened to see the word structure, but this contemptuous forbearance towards ignorant egotism evidently turned the writer's head, for he has now assumed the position of mentor for the American Society of Mechanical Engineers, and is trying to instruct men who know something about mechanical science. There is an old proverb which contains words of wisdom that might often prevent our friend from putting himself in a ridiculous position if he would take them to heart. It says *ne sutor ultra crepidam*, which being interpreted into railroad parlance, means "let the trackman desert not his tamping pick." It might also be open to the construction, "a man is not likely to make himself ridiculous so long as he writes about what he knows."

A Check to Corporate Rapacity.

We desire to add our mite to the volume of indignant protest called forth by the high-handed proceedings of the Manhattan Elevated Railroad Company early in January, for the purpose of frustrating an apprehended strike of the locomotive engineers of the lines. A more flagrant disregard of chartered limitations, of the amicable relations of a corporation with its employés and of its obligations to the public, was never before exhibited by an arrogant and domineering monopoly.

The engineers had presented a perfectly civil and reasonable request for a shortening of the hours of labor, and a day was named by the General Manager when the request would be considered. The company, however, on the day before the appointed time and before the conference could be held, stopped the running of its trains on the two non-paying lines of the system and in violation of its franchises, thus suddenly forcing vast numbers of people to seek other means of getting to and from their places of business, and throwing out of employment a host of operators of inferior grades against whom there was no cause of complaint. In addition to this, the company at the same time circulated a paper couched in language like that of a feudal lord to his vassals, to be signed by the engineers and firemen, as a token of their "fealty" to the corporation by which they were employed.

There were obviously two motives for closing the non-paying lines, namely, to enhance the profits of the other lines, and to direct against the discharged engineers the indignation of the public on account of the inconvenience and annoyance to which it was subjected. Both devices, however, not only signally failed, but the company was speedily brought to a realizing sense of the legal consequences of its blundering rapacity, and operations on the abandoned lines were resumed as soon as it was ascertained that its chartered privileges were imperiled. The company has unwittingly taught itself a lesson in these proceedings that it is to be hoped will not have to be taught over again.

Answer Association Circulars.

Last month we published a copy of a circular issued by a committee appointed by the Master Mechanics' Association to investigate the subject of Driver Brakes. In this issue we publish circulars calling for information on Balanced Valves, on Best Material for Cross-Heads and Guides, and on Shop Tools. All these subjects are of living importance to the Master Mechanics' Association and to the mechanical departments of all our railroads. It is very desirable that good reports should be prepared indicating safe practice to follow and giving information for those who need it. Good reports can only be prepared from full data, and that it is the duty of the individual members to supply. There are very few members of the Association who have not facts to record which would be of value to the whole body, but in numerous instances really interesting information is kept back through mistaken modesty, or the belief that they might not be properly appreciated. That is a very great mistake. Any thing a mechanical man is doing which he has not seen others doing in the same way, will excite interest. We would then earnestly urge that circulars of inquiry be rescued from the pigeon-holes where many of them have been placed, their questions considered, answered and sent to the proper destination.

WE have received from Mr. Geo. Hackney, Superintendent of Machinery of the Atchison, Topeka & Santa Fe Railroad, a statement showing the work done between November, 1884, and October, 1885, by one of the four long stroke locomotives built lately by Mr. Hackney and described in our last issue. The miles run were 56,273; the cars hauled one mile were 546,676, or over 9 to each train. The passengers hauled one mile aggregated 29,518,180.

THE *Street Railway Railway* is a new venture in the field of journalism, and appears to be a very creditable candidate for public favor. The paper is published by Walden, Monroe & Co., Chicago, and is under the editorial charge of Mr. George B. Heckel, an able, scholarly young man, who is making his mark as a journalist. The paper contains the first part of what will be a series of articles on the Construction, Equipment and Maintenance of American Street Railways, by Mr. Augustine W. Wright the well-known railroad and street railway engineer. No man in America is better able to do justice to this subject than Mr. Wright.

Correction.

In the report of the December meeting of the Master Car-Builders' Club, published in our last issue, the name of W. W. Lobdell was inserted instead of George G. Lobdell, Sr. The first-named gentleman was not present.

Mr. Lobdell was reported as saying in the course of the discussion that, with regard to sharp flanges, he did not know of any class of mechanics that had more sins to answer for than wheel makers. It should have read "*other people's* sins to answer for."

He also said, "The Bagnall axle was made of alternate layers of fibrous and granulous iron, and that the fibrous part gave toughness to the axle, and the granulous part stiffness."

MR. ALLEN COOKE, master mechanic of the Chicago & Eastern Illinois Railroad, is patentee of a very simple and ingenious bell-ringer for locomotives. No bell-rope is required for locomotives equipped with this ringer, and the apparatus needs scarcely any attention. It is got out so cheaply that the saving in bell ropes will pay for the ringer within a very few years. The Chicago, Milwaukee & St. Paul Railroad has lately put several of the ringers upon their passenger engines, and the men are highly pleased with them.

The McKeen Car Coupler.

AN improvement has recently been made in this coupler. It consists in the substitution of two cams for the bail formerly used to raise the link for coupling. These are so arranged in the orifice of the coupler that it is impossible to bend or break them. An improvement has also been made in the controlling rods. Formerly there were two rods, one to control the link and the other to draw the pin. Now the same rod raises the link, draws the pin, and sets it not to couple. This can all be done from either side of the car without taking the hand off the lever handle.

"Locomotive Engine Running and Management," by Angus Sinclair, is used on the Central Pacific Railroad as a text-book for examination of firemen before they are promoted to the position of engineers.

The Railway News, of Philadelphia, which was established in 1883, is to be published hereafter by a company bearing the name of the paper. The editors, who are also officers of the company, are Alex. C. Kenealy and Richard M. Elliot.

A TREATISE ON BELTS AND PULLEYS. By J. Howard Cromwell. John Wiley & Sons, New York. 271 pages. Price $2.

This is a very complete and comprehensive treatise, and is worthy of the attention of all mechanics who have anything to do with the management of belts and pulleys. It contains full explanations of fundamental principles, directions for the proper disposition of pulleys, rules, formulas and tables for determining widths of leather and rubber belts and belts running over covered pulleys, strength and proportions of pulleys, drums, etc., together with rules and principles applicable to rope gearing and transmission of power by metallic cables. With index and numerous illustrations.

THE Cummer Engine Co., of Cleveland, O., have just been awarded contract for one 50-ton refrigerating plant for Benitez Sobrino & Co., of Puentes, Grandes Habana, Cuba. They have also received orders for a 100 h. p. engine with boilers, etc., complete, for Stinnett, Rucker & Co., of Sherman, Tex., and for a 170 h. p. engine for G. W. Straight, of Chicago, Ill. Among their recent shipments are a 415 h. p. engine to the Manchester Print Works, Manchester, N. H.; a 160 h. p. condensing engine to Cowden Bros. & Hoppe, of Hanna, Ind.; an 89 h. p. engine to the Somersworth Machine Co., Dover, N. H., and one of 90 h. p. to Frank Baer, of Greensburg, Pa.

MR. C. L. WORMER, President of the Oriental Metal Co., of Boston, reports that the company has orders on its books for 180,000 pounds of car journal bearings.

THE Eames Vacuum Brake Company, Watertown, N. Y., have enlarged their works very considerably, and have put in 25 new machine tools and an Edison incandescent electric light plant. The company contemplate doubling the present capacity of the works, the recent enlargement being insufficient for keeping up with the orders received. Their pay roll is nearly six times as large as it was a year ago.

THE Pop Safety Valve suits that were brought by the Consolidation Safety Valve Co. in the United States Circuit Court, for the district of Massachusetts, have been decided in favor of the Ashton Valve Co. They were based on the Richardson patents, Nos. 58,294 and 85,963, which were held valid by the United States Supreme Court last spring. In the first suit the bill is dismissed, and in the second suit the injunction is refused. In view of the general threats made by the Consolidated Safety Valve Co., this victory of the Ashton Valve Co. is of great importance to all users of pop safety valves.

THE Dillon Nut Lock Co., of Cincinnati, are manufacturing nut locks that have proved to be very effective upon engines, cars, brakes, track-bolts, etc., by two years of testing in regular service.

MR. HENRY A. LITTLE, lately associated with W. R. Ellis, of New York and Boston, and formerly with Aaron French & Co., will in future represent the United States Concave Spring Co., of Jersey City, N. J., having an office in No. 34 Duncan Building, Pine street, New York.

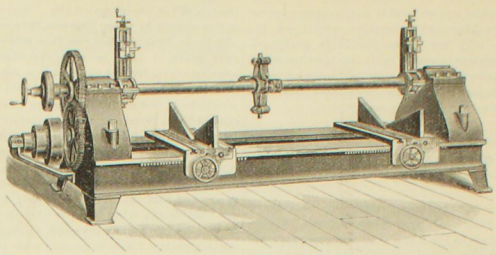
THE well-known crucible cast steel makers, Anderson, Du Puy & Co., Pittsburgh, have established a spring department. They have secured for general Western agent Mr. Joseph M. Rogan, who has been for many years identified with that line of business. His office is in Room 12, 175 Dearborn street, Chicago, Ill.

THE use of natural gas is getting to be an important feature in the manufacturing industries of Pittsburgh, and the very moderate prices quoted for sites are worthy of the attention of manufacturers who may wish to locate in that city in order to avail themselves of the economies of the gas.

THE Southern Time Convention have presented to Mr. W. F. Allen, Manager of the National Railway Publication Office, a handsome silver table set as a token of their appreciation of his services in bringing about the existing standard time reform, and which has been adopted by nearly all the railways of the country and by most of the municipalities.

THE STOW FLEXIBLE SHAFT CO., Limited, of Philadelphia, have recently made large sales of their flexible shafts for reaming rivet holes in bridge girders. The Phœnix Iron Co., of Phœnixville, Pa., have bought four of the largest plants in a single month. These are operated on bridge beams at a distance of from 100 to 250 feet away from the countershaft, and do their work so effectively that the aforesaid company bought them after five years' experience with the same tools at shorter distances.

ABOUT a year ago, Mr. Whitney, mechanical superintendent of the Intercolonial Railway of Canada, made a change in the position of the guide-bars of the eight-wheel locomotives, and altered the cross-heads so as to get in steel pins for the wrist connection instead of cast-iron, which had previously been used. He says they find this to be considerable of an improvement.

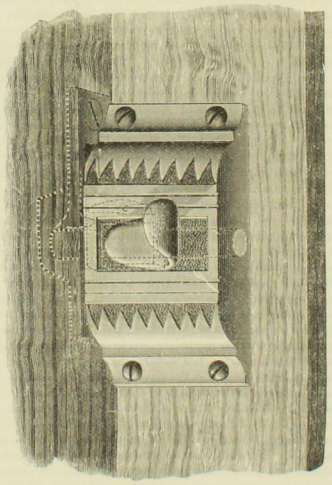


CYLINDER BORING MACHINE.

The cut represents a new cylinder boring-machine, designed and built by Pedrick & Ayer, proprietors of the L. B. Flanders Machine Works, Philadelphia. The machine will bore from 8" to 22" cylinders, facing off the ends and boring at the same time. The flanges are turned afterward, as the saddle that the cylinder is fastened to has a movement of several inches either way. A bent tool is placed in the facing-head, and the cylinder is moved. The V's that hold the cylinder are each independent and adjustable, allowing any shaped cylinder to be quickly brought central. The clamping device is one of the principal features. A detachable link-chain, that can be lengthened or shortened, holds the cylinder, allowing very little opportunity for springing. By loosening one collar screw, the bar can be pulled clear of the cylinder and shoved into its place after cylinder is placed on the V's. The feed-casing on the end of the bar contains gearing that admits of several changes to suit the work. This gearing is driven by a 4-step cone. The head or bar support, on opposite end of the driving gear, slides on shears to accommodate different lengths of cylinders. The machine is neatly and strongly built, as well as powerful; is adapted to new work in shops, and is sold at a moderate price. The cut was made from a perspective drawing, and may be somewhat faulty in its proportions.

The McKeen Automatic Sash-Lock.

The engraving represents a new and improved sash-lock for the windows of railway cars. It is the invention of Mr. Thos. L. McKeen, of Easton, Pa., and is so constructed that by simply pressing upon the thumb-piece before raising the sash, the window can be raised without a continuance of the pressure, the bolt being held clear of the socket by a catch until the sash is lowered, when the device locks itself automatically at any point where the sockets attached to the window frame are located, both hands being at liberty to raise or lower the sash. The invention is very simple and ingenious, and its superiority to the ordinary devices in the matter of convenience will be appreciated, especially by ladies. Mr. McKeen is also the inventor of the McKeen car coupler, which made such a satisfactory record at the recent trial tests at Buffalo. For any additional information he may be addressed as above.



THE Baltimore Car Wheel Co. has issued six large and beautifully executed photo-collotype views of the exterior and interior of the shops of the company, the office building, and a street car in front of the works showing the "Brooklyn standard car gear," manufactured by the company. As specimens of pictorial art, these views are admirable.

MR. JOHN A. WALKER, of the Dixon Crucible Co., of Jersey City, N. J., contributes an interesting article on Graphite to the "Mineral Resources of the United States," recently published by the Government. The Dixon Co. have for many years given special attention to the development of this mineral by purifying the ore and adapting the product to various mechanical uses. The mines of the company are at Ticonderoga, N. Y. The production in 1883 amounted to 550,000 pounds, but during 1884 the mining operations were suspended in consequence of the business depression and accumulated stocks. Active work, however, will be resumed during the present year, and with the improved ore-dressing machines of Mr. William Hooper, the manager of the mines, the finest graphite in the world will be produced from a 10 per cent. ore. In reference to its use in foundry work, Mr. Walker says that the demand for it is rapidly increasing, especially for the more elaborate and highly finished castings. Its value as a lubricant has long been recognized, its co-efficient of friction being very low, and its enduring qualities much greater than those of oil. It is not affected by heat or cold, steam, acids, etc., and acts equally well under varying conditions of moisture. To secure the best results, however, graphite for lubricating should be of a uniform, correct sizing and purity, and these qualities are now attained by the improved processes for ridding the mineral of its natural impurities, which are so difficult to detect that the difference between a perfectly pure graphite and one almost pure is not apparent to sight or touch.

Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

Atlantic & Pacific.—D. H. Dotterer has been appointed Superintendent of Motive Power and Machinery, vice J. G. McCuen, deceased.

Baltimore & Ohio.—A. Gordon Jones has been appointed Assistant to General Manager; F. M. Britton, Superintendent of Chicago Division; Thos. Fitzgerald, Superintendent of Central Ohio, Lake Erie and Straitsville Divisions; and W. H. Harrison, Superintendent of Motive Power, vice John C. Davis, resigned.

Canadian Pacific.—Harry Abbott has been appointed General Superintendent of the Pacific Division, and will have charge of the lines of the company in British Columbia.

Columbus & Rome.—M. E. Gray has retired as Superintendent, and the office has been abolished.

Dayton & Union.—W. F. Stark has been appointed Superintendent, in place of J. H. Barrett resigned.

East Tennessee, Virginia & Georgia.—J. W. Frey has resigned as Superintendent of the Georgia Division, and has gone to the Mobile & Ohio.

Little Rock & Fort Smith, and Little Rock, Mississippi River & Texas.—A. S. Horner has been appointed Superintendent of these roads, vice F. A. Lister resigned.

Louisville, New Albany & Chicago.—A. F. McClatchey has been appointed Superintendent of Motive Power.

New York, Lake Erie & Western.—The office of R. H. Soule, Superintendent of Motive Power, has been removed from Susquehanna, Pa., to Buffalo, N. Y. J. H. Barrett has been appointed Superintendent of the Eastern Division, vice E. O. Hill, resigned; and R. P. Shaler, Superintendent of Eastern Division of New York, Pennsylvania & Ohio leased line, vice A. L. Dunbar, resigned.

Pennsylvania.—Frank E. Ellmaker has been appointed Superintendent of the Belvidere Division, in place of John A. Aduerson, assigned to other duties.

St. Louis & Hannibal.—This company will henceforth operate the St. Louis, Hannibal & Keokuk road under the above name. W. I. Brokaw is Master Mechanic.

Sioux City & Pacific.—W. F. Fitch has been appointed General Manager, vice W. B. Linsley resigned.

Texas & Pacific.—A. A. Egbert has been appointed General Superintendent, vice Warder Cumming resigned.

Toledo & Ohio Central.—J. M. Ferris has been appointed General Manager, vice J. E. Martin resigned.

West Shore.—Wm. Buchanan has been appointed Superintendent of Motive Power and Rolling Stock, and James M. Boon Assistant Superintendent of Motive Power and Rolling Stock.

Employment.

WANTED.—By a first-class draftsman and practical car-builder, a situation in a railroad car-shop, as draftsman or in some other capacity. The advertiser is well acquainted with the construction of sleeping cars, ordinary coaches and other cars; has had long experience, and can furnish the best recommendations. Is a married man. Address F. H. G., office of the NATIONAL CAR-BUILDER.